EA-87-02

Ontario

ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: 164

DATE: Monday, December 4th, 1989

BEFORE: M.I. JEFFERY, Q.C., Chairman
E. MARTEL, Member
A. KOVEN, Member

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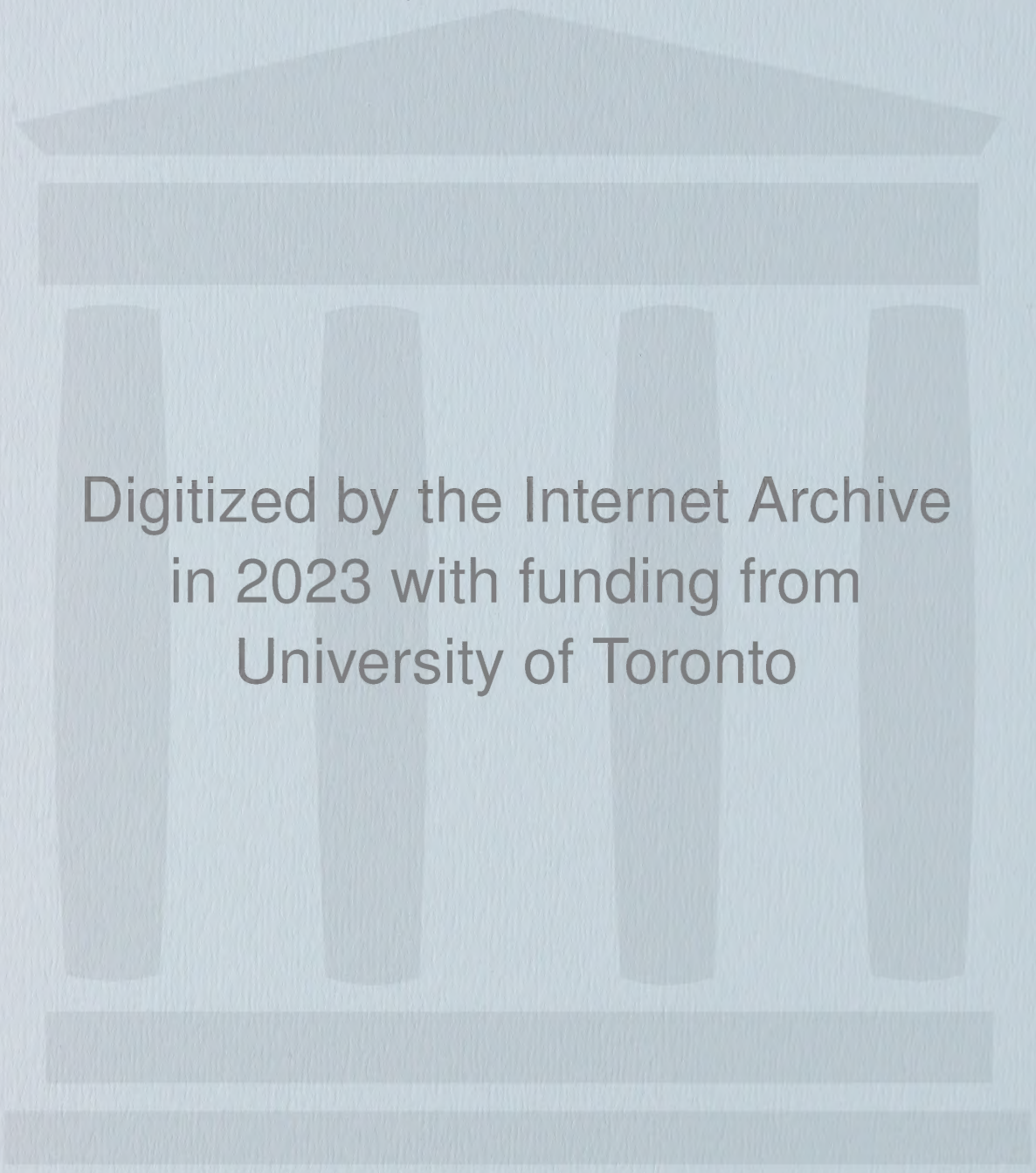

EA-87-02

HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental Assessment for Timber Management on Crown Lands in Ontario;

- and -

IN THE MATTER OF a Notice by the Honourable Jim Bradley, Minister of the Environment, requiring the Environmental Assessment Board to hold a hearing with respect to a Class Environmental Assessment (No. NR-AA-30) of an undertaking by the Ministry of Natural Resources for the activity of timber management on Crown Lands in Ontario.

Hearing held at the offices of the Environmental Assessment Board, 2300 Yonge Street, Suite 1201, Toronto, Ontario, on Monday, December 4th, 1989, commencing at 9:00 a.m.

VOLUME 164

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member

A P P E A R A N C E S

MR. V. FREIDIN, Q.C.) MS. C. BLASTORAH) MS. K. MURPHY) MS. Y. HERSCHER)	MINISTRY OF NATURAL RESOURCES
MR. B. CAMPBELL) MS. J. SEABORN) MS. B. HARVIE)	MINISTRY OF ENVIRONMENT
MR. R. TUER, Q.C.) MR. R. COSMAN) MS. E. CRONK) MR. P.R. CASSIDY)	ONTARIO FOREST INDUSTRY ASSOCIATION and ONTARIO LUMBER MANUFACTURERS' ASSOCIATION
MR. H. TURKSTRA	ENVIRONMENTAL ASSESSMENT BOARD
MR. E. HANNA) DR. T. QUINNEY)	ONTARIO FEDERATION OF ANGLERS & HUNTERS
MR. D. HUNTER) MS. N. KLEER)	NISHNAWBE-ASKI NATION and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI) MS. M. SWENARCHUK) MR. R. LINDGREN)	FORESTS FOR TOMORROW
MR. P. SANFORD) MS. L. NICHOLLS) MR. D. WOOD)	KIMBERLY-CLARK OF CANADA LIMITED and SPRUCE FALLS POWER & PAPER COMPANY
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MR. R. EDWARDS) MR. B. McKERCHER)	NORTHERN ONTARIO TOURIST OUTFITTERS ASSOCIATION

APPEARANCES: (Cont'd)

MR. L. GREENSPOON) MS. B. LLOYD)	NORTHWATCH
MR. J.W. ERICKSON, Q.C.) MR. B. BABCOCK)	RED LAKE-EAR FALLS JOINT MUNICIPAL COMMITTEE
MR. D. SCOTT) MR. J.S. TAYLOR)	NORTHWESTERN ONTARIO ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL) MR. S.M. MAKUCH)	GREAT LAKES FOREST
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
MR. D. COLBORNE) MS. S.V. BAIR-MUIRHEAD)	GRAND COUNCIL TREATY #3
MR. R. REILLY	ONTARIO METIS & ABORIGINAL ASSOCIATION
MR. H. GRAHAM	CANADIAN INSTITUTE OF FORESTRY (CENTRAL ONTARIO SECTION)
MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
MR. M. COATES	ONTARIO FORESTRY ASSOCIATION
MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY

APPEARANCES: (Cont'd)

MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON
MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION

INDEX OF PROCEEDINGS

INDEX OF EXHIBITS

---Upon commencing at 9:00 a.m.

THE CHAIRMAN: Good morning everyone. Please be seated.

Ladies and gentlemen, this will be a short session right now because I think you have already been advised, Dean Baskerville had difficulty getting out of New Brunswick last night because of a snowstorm and we understand that he will be leaving for Toronto first thing this morning and should be arriving here at approximately 10:15 and he will be coming directly to the Board, so that we should be in a position to commence, I would suspect, around 11:30 this morning. It is unfortunate that we have lost this time, but we can't do much about the weather.

Now, instead of calling around - I learned about this late last night - instead of calling around to all of the parties, I thought that since you will all be here you might nevertheless be able to use your time productively in terms of getting together. The Board will retire and you can have the full use of the hearing room to discuss some issues that are outstanding.

I had understood mistakenly that Ms. Seaborn had requested the use of the room after the session on Wednesday, unfortunately I thought it was

after today and, therefore, I thought you could use the time later today right now. Since that is not the case, I would ask that perhaps the parties consider entering into discussions amongst yourselves with respect to the contents of a letter that was delivered to the Board from Mr. Hanna on Friday concerning the powers of the Board with respect to amending the purpose of the undertaking as set down or defined by the proponent.

Now, if any of you need copies of that letter the Board will be able to provide it.

Mr. Hanna, was that letter distributed to other parties?

MR. HANNA: Yes, Mr. Chairman. As indicated in the covering letter to you, it was circulated to the parties rather than the Board originally hoping that we could deal with it outside of the hearing. As a result of Mr. Freidin's statement at the Panel 17 scoping session, I felt it was appropriate at that time to forward it to you, but the other parties have received it.

THE CHAIRMAN: All right. Well, in any event we will make additional copies available to any of the parties here so that perhaps you can enter into some discussions on it and if you get anywhere, then it

may not necessitate bringing it to the Board formally.

If it does necessitate bringing that matter to the Board, once again, the Board feels it is one of the issues that can have some very serious ramifications vis-a-vis the remainder of the hearing and we will likely be asking parties to present formal submissions on the points raised by Mr. Hanna so that the Board will be in a position after full submissions to make a ruling on that issue.

Again, it may have some ramifications vis-a-vis the rest of the hearing in terms of the timing and matters that have not been addressed in the documentation to date.

So beyond that, we apologize for Dean Baskerville not being here, but hopefully the time amongst the parties will not be wasted.

Ms. Swenarchuk?

MS. SWENARCHUK: Yes. I just point out that on the issue raised by Mr. Hanna's letter, it is an important issue for Mr. Hunter and Ms. Kleer's clients and I don't see either of them present today so...

THE CHAIRMAN: Well, I am not suggesting there is going to necessarily be a resolution--

MS. SWENARCHUK: Right.

THE CHAIRMAN: --at this time, but you might use the time, rather than just sitting around gazing at our artwork, to perhaps discuss it since you are all here, and then of course the other parties will join in at the appropriate time.

Are there any other matters of a preliminary nature now that we can deal with instead of waiting until later?

(no response)

Okay. I think then we will adjourn until -- Mr. Turkstra, 11:30, would that be appropriate?

MR. TURKSTRA: It may be eleven o'clock, sir.

THE CHAIRMAN: All right. Well, we are here, so if you would just get word back to us we will arrive when Dean Baskerville does.

Thank you.

---Recess taken at 9:05 a.m.

---On resuming at 11:50 a.m.

THE CHAIRMAN: Thank you. Be seated, please.

Very well, ladies and gentlemen, we are ready to commence with the examination of Dean Baskerville.

Welcome, Dean Baskerville.

DEAN BASKERVILLE: Thank you.

THE CHAIRMAN: And we will commence of course with Mr. Turkstra leading Dean Baskerville through the direct evidence-in-chief.

We are hoping, Dean Baskerville, to proceed as expeditiously as possible and we will probably be adjourning today at approximately 5:00 p.m. There will be some breaks of course inbetween and we will all break for lunch and have some breaks for both the reporters, yourself and the rest of the participants.

If at any time during the testimony you wish to break for a particular reason, just notify us and we will be pleased to accommodate you.

Other than that, we are going to proceed with the direct testimony which Mr. Turkstra advises the Board will likely not last more than a day, although because of the delay in starting this morning it may extend over into tomorrow morning. We still anticipate having no difficulty in completing the examination of Dean Baskerville by the end of next week.

Mr. Turkstra?

MR. TURKSTRA: Mr. Chairman, I notice we

have desk microphones here. Do you want me to...

THE CHAIRMAN: Well, whatever is more convenient, quite frankly. You can use the desk microphone; if you find it more convenient you can use the microphone at the podium for the examination.

MR. TURKSTRA: Actually this is a big hinderance in my getting back and forth to Dr. Baskerville.

THE CHAIRMAN: All right. So why don't you remove that and then do it from a seated position at the counsel table.

MR. TURKSTRA: And that way I am also not blocking the people who are sitting behind me.

THE CHAIRMAN: It may be better, Mr. Freidin, while you are up to perhaps shut that door. Well, Mr. Dadds can do it.

MR. FREIDIN: I can put up an overhead or two as well, Mr. Chairman.

THE CHAIRMAN: We will find some odd jobs for you as we go along.

MR. TURKSTRA: Thank you, Mr. Chairman.

Dr. Baskerville, can you hear me okay?

DR. BASKERVILLE: Yes, I can.

MR. TURKSTRA: And can everybody here Dr. Baskerville?

MR. COSMAN: Just a little bit louder.

MR. TURKSTRA: Is your button on?

DR. BASKERVILLE: I think so. Yes, it is.

MR. COSMAN: That's better.

MR. TURKSTRA: Okay.

THE CHAIRMAN: Can everybody hear at the back?

(no response)

DIRECT EXAMINATION BY MR. TURKSTRA:

Q. Dr. Baskerville, you have a copy of your witness statement and attached to that is a summary of your experience?

A. Yes, I do.

Q. And I would like to just take a few minutes and highlight some of the aspects of that and perhaps to amplify it a little bit.

MR. COSMAN: Mr. Chairman, I am sorry, it is not Dean Baskerville but Mr. Turkstra. It may be that his machine is not on.

MR. TURKSTRA: Well, it is on. I will try that. Is that any better? Am I getting through now?

MR. COSMAN: A little bit.

THE CHAIRMAN: I think perhaps before we

commence perhaps we will have you sworn.

If I can find the book I will do so in a moment.

DR. BASKERVILLE: I have got a management text with me, will that do?

THE CHAIRMAN: No, I am not sure that's the one.

I apologize for this, we thought it was up here but it appears not to be.

I think, Mr. Turkstra, if you want to continue with the qualification and the review of the curriculum vitae you can do so at this time.

MR. TURKSTRA: Is that any better?

MR. COSMAN: Yes.

MR. TURKSTRA: Okay.

Q. Dr. Baskerville, I just want to take you to Exhibit A then, to your statement, just to note that after you received your Bachelor of Science in Forestry, 1955 it shows that you spent 15 years as a research scientist.

Can you tell the Board in a general way where you were located, what your relationship to the forests in New Brunswick were, and how you lived and worked during that period?

A. Yes. I worked the first 15 years in

what is known as the Green River Project. It is a field station in the northwest corner of New Brunswick next to a company logging camp about 40 miles into the woods and I lived there from May of each year through until about October and as my family developed they actually came and lived there with me.

It was a group that studied spruce budworm and the forest that it lived on, and there were entomologists there and foresters. There were about two researchers who worked there regularly, myself and one another, about four or five others who worked there for part of each summer, and anywhere up to about 30 students.

THE CHAIRMAN: Okay. Excuse me just one second. I think there is some difficulty in hearing at the back of the room and I will try and adjust this system here just slightly.

MR. COSMAN: Mr. Chairman, it seems to be coming on and off from the back from the perspective at the back of the room.

THE CHAIRMAN: Can you talk again, Dean Baskerville?

DR. BASKERVILLE: Yes. Can you hear me now?

MR. COSMAN: Yes.

THE CHAIRMAN: Is that coming through clearly?

DR. BASKERVILLE: How about now?

MR. FREIDIN: It is not coming through the system at all.

---Discussion off the record

MR. FREIDIN: Let me try this.

THE CHAIRMAN: We do have a technician here that supposedly can adjust this system.

MR. FREIDIN: Will that work, Mr. Chairman?

DR. BASKERVILLE: Does that work better?

MR. COSMAN: Yes.

THE CHAIRMAN: Okay. Okay, let's go.

DR. BASKERVILLE: We finished Green River.

MR. TURKSTRA: Q. All right. And then on the second page of that I note that you did some time at Oakridge National Laboratory, and could you just tell the Board what that experience was about?

A. It wasn't really doing time. After I had graduated and worked in the field for some time I had come to look at mathematical characterizations of the forest and the stands in the forest, and I wanted to pursue modelling; the development, the dynamics of

stands in forests, and at that time there were only one or two places where there were research groups who were working primarily in models and using computers and one of them was at Oakridge National Laboratory, so I spent a year there mostly learning how to communicate with a computer and how to build biological models.

Q. And then it appears that you came back to the Canadian Forestry Service -- this has died, has it?

MR. COSMAN: (nodding affirmatively)

THE CHAIRMAN: Just a second.

Excuse me, ladies and gentlemen, we might as well get this settled right now.

---Discussion off the record

THE CHAIRMAN: Is it still not working?

MR. COSMAN: We will do our best, Mr. Chairman.

THE CHAIRMAN: All right. If we could continue on with the qualification as best we can, and during the lunch break we will attempt to have this system organized properly.

---Discussion off the record

MR. TURKSTRA: Do you want Dr. Baskerville sworn?

THE CHAIRMAN: Yes.

DR. GORDON BASKERVILLE, Sworn

MR. TURKSTRA: Q. I have you in this as a professor at the UNB Faculty of Forestry from '74 to '80 and I have a note that environmental law was part of that experience. Can you tell the Board about that?

A. Yes. My first invitation to teach was from the UNB Law School to assist another law professor in teaching environmental law for three years. I've often said that it taught me two things; one was that I wanted to teach and the other was that the law wasn't the way to do it.

At that same time I worked regularly with a large group of modellers, mostly from the University of the British Columbia, in trying to characterize again budworm and the forest that it lives in in a manner that would make it possible to do policy analysis for the whole province.

Q. And the next item is in 1980 to 1982, position as Assistant Deputy Minister. Can you tell the Board how that came about, how did you get to that position?

A. Near the end of our modelling exercise I became incredibly frustrated as a scientist with the total inability of our team to have any influence on the world.

I wrote a paper explaining in considerable detail my dismay and the reasons why I thought why we hadn't made it. We had a new minister, I gave him a copy before I went away to give the paper and when I came back he challenged me, first saying that he didn't believe it and becoming very obnoxious, and after two hours saying that he did believe it and that if I had any nerve at all I would come and work for him, at which point I asked when and he said tomorrow morning.

The next day he called and said they had created a position, Assistant Deputy Minister, Resources and was I coming or not. And that's how I went to the province.

Q. What was that job?

A. Assistant Deputy Minister, Resources was a new position to which all of the renewable resource directors reported. So that, in essence, I had some responsibility for all renewable resources; wildlife, fish and trees.

Q. What kind of financial responsibility?

A. I am trying to remember. The total budget that was involved would have been in the area of $20-million, substantial.

Q. And what was your responsibility with regard to that?

A. Mostly to get it allocated to the directors. I didn't spend much of it directly myself.

Q. And then in '82 I note that you went back to the University of New Brunswick. And while you were Assistant Deputy Minister you were actually on leave from the university?

A. That's correct. Because of the nature of, the timing of the way I went I asked for leave, or I actually resigned from the university and they suggested that we make it a leave and that's what it was. So in fact when I came back it was like a transfer in and out.

Q. And I take it you have been the Dean then from 1982 to the present time?

A. That's correct. I had a one-year study leave in there during which time I worked for Canadian Pacific Forest Products in Vancouver.

Q. Can you tell the Board a bit about that study leave and the work that you did for Canadian Forest Products?

A. I was anxious to see how the industry made forest management decisions, so I wrote the company and explained my desire, that I wanted to be

paid for it so that we took each other seriously, and that I was willing to do a leave from the university if they would hire me and I would take any position, anywhere in their forest management decision structure above tree planter.

But I was anxious to observe how the system -- how they made decisions and, in fact, I worked with the chief forester for about two months right in his office, and then following that time I was pretty much on my own doing jobs for the company.

Q. What kind of assignments would you have been given in a general way?

A. Much of it had to do with building their wood supply analysis, their forecasts of timber supply in terms of -- it was made in terms of volume, but their mills consume primarily logs, and their desire was to configure the forecast so that they could see what the flow of logs to their mills would be rather than log qualities. There are about 20 different log qualities out there and they wanted to see the flow of log quality rather than just raw volume.

Q. All right. Have you done any work for them since coming back to Fredericton?

A. I went -- I don't know whether it was

work for them or not, but I went and spoke to one of the hearings that Minister Parker in B.C. had on the issue of land tenure and the company paid my airfare.

THE CHAIRMAN: Land tenure?

THE WITNESS: Land tenure; correct, sir.

MR. TURKSTRA: Q. And have you consulted with industry?

A. Yes, frequently. Again, I find it useful in teaching it, not just professionally, to work -- I have four or five companies that I would spend time with in the field each summer and write reports for them on their management progress.

Q. To understand, Dr. Baskerville, then, going back to the start and coming up to the present time, you have worked in the forest. Would the early days be working as a forester; is that -- am I close to it?

A. Yes, in the forest. Actually, I think, while I have worked at a lot of different things, my thrust I would say has been a forester in the professional sense, that that's what I wanted to do.

My interest in every one of those moves had to do with trying to make a difference, I guess, at some place at some time. The original field work was

primarily research, I became interested in forecasting which led me to interests that got scale change actually, I started out looking at bugs and branches and then to trees, then to stands. By the early 70s I found myself looking at a whole forest, millions of hectares at a time, and trying to model them. I guess my main interest now is at that level.

Q. That would have been sort of a progression from the size of the units that your attention has been directed to?

A. That's correct.

Q. What would you say your focus is at the present time, it is over 1989, '88 and the last couple of years, your real area of interest and what you think you have some expertise in?

A. I found it easy and comfortable to do evaluations of forest management performance either for the Province of New Brunswick or for several companies, so that I would say that I felt comfortable and expert in that area.

Q. Do you fish?

A. Yes, I do.

Q. How close to the forest do you live today?

A. That was part of the problem of me

not being here, is that I live right in it and I got snowed in quite badly yesterday. I live about 30 miles from town and I guess most of my friends know that in the summertime I get up early and spend a couple of hours salmon fishing on my way to work in the mornings.

Q. Are there some broad concepts in terms of managing forests that you teach or adhere to?

A. I teach forest dynamics. I structured that course originally as a fifth-year course and then as a bring-together course at the end of a five-year undergraduate program, and three years ago we moved that to a first-year course using exactly the same labs with the intent of capturing students' minds at the front end of the program, give them an index of the kinds of things they would need to learn in order to manage a resource.

I teach ecological modelling which is just what it says, it is modelling biological/ ecological systems and I teach forest policy. That modelling class would normally be on right now.

Q. All right. I will put that away and can I take you to the audit then for a minute.

And before I start on that, perhaps just for the record, Dr. Baskerville, can you confirm that I provided you with a copy of the extracts of the

transcript of the hearings before this Board in this matter in which you were referred to?

A. That's correct.

Q. All right. And you have had an opportunity to review that?

A. Yes.

Q. And you have seen the witness statements from the various parties -- or the statements of issues rather from the various parties?

A. Yes, I have.

Q. And considered it prior to coming here today.

All right. Then moving on to the audit which in these proceedings, Dr. Baskerville, is sometimes referred to as Exhibit 16. You may hear it referred to that way as well.

Can you tell the Board how you got started on this?

A. My connection with the audit I believe began with a phone call from Mr. Armson in October of '85 at which we discussed the possibility of such an exercise and in very broad terms what sorts of things it might be possible to do in a relatively short time frame.

That was followed up by a meeting with

the Minister, the Deputy, and one or two others, I know Mr. Armson was present, at which point we decided that in general terms, or at least in principle what would be done and agreed that we would -- I believe what the Minister wanted was a contract that was all on one eight-and-a-half by eleven page, and we came to that agreement. It was some time in January before I actually began work.

Q. What did you understand your terms of reference were, or what was your task?

A. To evaluate the process and procedures for managing Crown forests in Ontario, I guess in the broadest sense.

It didn't take much discussion to discover that it would not be possible to carry out a numerical evaluation of the entire 48-million hectares of Crown forests, so it was agreed that I would examine some part thereof and would concentrate on the process of management design and management implementation and control.

Q. How did you go about carrying out that assignment?

A. I began by reading an awful lot. I read everything I could lay hands on in terms of background to production policies and the design of

management in the province. Beginning mid-January, I spent four days a week in Toronto and the general process was simply to work my way through all of the material that I could find that provided background for what I would find in the field.

I read manuals, production policies, those things I guess particularly, management guidelines, and I decided that the most appropriate way to apply an audit would be to pick a small number of the 117 management units and review them in detail in terms of their application of the processes as they were described in the various procedures and manuals.

And towards that end I had someone in the branch make me a list of all management units by whether they were an FMA, Crown managed -- I'sorry, industry managed or Crown managed, by whether or not they had had a whole five years of management planned with the first review; like, I wanted to examine only units that had had at least one five-year review of the management plan.

I overlaid those on a map and -- oh, there was one other thing, they were to show me the relative proportion of sawlogs and pulpwood and intensity of recreation use on these things.

I overlaid those on a -- just laid them

on a map and picked them across to cover the kinds of forest cover generally, so that I had one in the south, then the ones across the north by different ownership, different mixes of sawlog versus pulp requirements.

Q. So the picking of the units was your responsibility?

A. Entirely.

Q. All right. And then having done that, what was your next step?

A. At about that same time I had read the manual that was about to come out. There were three manuals involved here, there was a manual made specifically for FMAs which was about to be replaced and an earlier manual that had been made for Crown land generally which was also about to be replaced by a manual that would come out in, I believe it was to come out in the spring of '86.

I read all of those in detail, I went over them with the staff who had written them or with the major ones in the control of their application. The newest one, I probably wrote almost as much in the margins as there was in it which is my way of writing questions to myself, and then sat down with the author for about two and a half days, as I recall, and we just went through, so that in the end I believe that I

understood that manual as well as anyone other than the author at that point in time.

I started looking at the management units in exactly the same way. I gathered up all of the management plans, operating plans, all of the material relevant to a unit and went through this material in detail in my own study or wherever I happened to be working until I had a list literally of questions that would cover -- you know, I glanced through them the other day, there are probably half a dozen questions on every page that I would have wanted to ask the person who wrote it if I had an opportunity.

Once I had done that for all of these plans and made -- picked particular questions that I wanted to ask in general as well, I went to the management unit. I was usually scheduled for a week, it didn't always take a week. The first day was spent with the equivalent of what was to be a management team; the people from wildlife, people from recreation, water, fisheries and timber.

The actual plans I looked at were made under the FMA and original Crown manuals so that they did not have a formal planning team, but all had -- there was the equivalent of that present who had reviewed all of these plans at the five-year review.

So I spent a day with them mostly trying to get a feel for how they viewed integration, how they viewed their particular role in the preparation and generation of the plan and approval of the plan, and then spent as many days as was required with the actual author of the plan and we simply went through paragraph at a time while I asked all the questions that I had listed until I had a good feel, comfortable feel for the nature of the plan, how it had been written, what it was intended to do and the way it had been implemented.

Q. And this was done for each of the units that you visited?

A. Six units.

Q. Six units. So that each of those units would have had a five-year plan that had gone through at least five years and was in a position where it could be reviewed. Do I understand that correctly?

A. That's correct. One of them had gone through four periods and the shortest one had gone through just one.

Q. All right. And the people that you were meeting with in each of the units, were they the hands-on people who were actually carrying a plan out?

A. Yes. They were the people currently

responsible for the implementation of the plan and I believe in every case - no, that's not true, I was going to say I had the author of the original one as well - but I certainly had the author of the existing plan in each case to talk to, and where there was continuity was able to talk to some of the older people.

Q. In terms of in the hierarchy at the Ministry, when you got out into the units would you have met the people at the regional offices?

A. Yes. As part of reviewing each one of those plans, I tracked it back through the district offices and read all of the correspondence file on the plan at the district office and talked to the district manager and the district people and then tracked it back to the regional office and did the same thing there with their correspondence.

Q. Just to identify that a bit. I take it that there were letter files at the management unit that were given to you; is that correct?

A. That's correct.

Q. And that would be correspondence including other things to the regional office from the management unit?

A. And normally the correspondence would

be from the unit forester to the district and then from the district to the region and from the region to Queen's Park.

Q. And in the case of the six units, were you given that correspondence at all those levels?

A. Yes. Anything I asked for I got. I don't recall ever having to ask twice.

Q. And did you have an opportunity then to actually see the forests that were being managed by the unit at the unit level?

A. Not really. We looked at a lot of maps, but if you recall the dates for this were January to June, so that in terms of actually carrying out on-site examination of these things, no.

I did examine at each unit the ledger system that is used to record their treatments and their various assessments of the stands and so on and satisfied myself that those were up to date.

In my view, our original agreement had not included that last bit of ground truth which is a major step. I believe that my role was to assess the process of managing rather than the outcome.

THE CHAIRMAN: Dean Baskerville, was the fact that field visits or field evaluation was not included within your mandate, was that a result of a

mutual agreement between yourself and the Ministry, or was it something that you wanted to do but they didn't want to agree to?

THE WITNESS: No, I think it was a matter of realism, sir. There was some concern that at least the process get reviewed in a timely manner. It seemed like that would take six months at least and, in fact, it was a hurried six months to do that, and certainly in six months there would be no opportunity to carry out field work.

So I think that was mutually acknowledged, that we could do one or the other and not both in six months.

THE CHAIRMAN: And one more question. Was the six-month time limit, was that something that was imposed right from the beginning? Suppose it had taken eight months or nine months, was that out of the question?

THE WITNESS: I don't know. I suppose it wouldn't have been. My nature is to try and meet deadlines I guess.

THE CHAIRMAN: But I guess what I am asking is: Was it a mutually acceptable deadline--

THE WITNESS: Yes.

THE CHAIRMAN: --as far as you were

concerned.

THE WITNESS: When we started, yes.

THE CHAIRMAN: Okay.

THE WITNESS: I might have wanted to renegotiate it halfway through to something like two years, but that was out of the question. Six months was a reasonable time, in my view, to make a first cut.

MR. TURKSTRA: Q. Were you satisfied with the level of information that was given to you by the Ministry in the course of that audit?

A. Yes. As I said earlier, I don't recall an instance where if something existed and I sought it that I didn't get it. There was occasion when I didn't get it, but it turned out it would have required immense compiling problems, immense amounts of compilation in order to get the numbers that I sought. Whenever anything was available it was made available to me.

Q. Now, before I go on to the next part of my questions, I just noticed that I missed one question I had for you back in the first stage.

You mentioned that you went to work for the Government of New Brunswick with a view to doing something. Looking back at it today, are you in a position to say whether or not you actually were able

to accomplish something?

A. It's hard to say whether I accomplished anything, but something sure happened and it has been an exciting thing to watch, both from the inside and from the outside, that the province realized literally collectively as a province in some time in late '79 that they had a problem in terms of wood supply and they ceased arguing about whether or not they had a problem and began arguing about how to fix it, which is quite a different argument.

What happened in the next seven or eight years has been quite exciting to watch. They put a cap on all mills, mill supply from Crown land, introduced quite strict control of management on Crown land, installed computerized mapping, geographic information system for every -- every stand in the province is now in such a system, have moved towards examining wildlife habitats much the way we began examining timber supply in the late 70s. So there is some exciting things happening there.

Q. Do you know the outcome yet?

A. No. I run hot and cold on that. It takes people to do these things, it is a relatively simple task. The paper that upset the Minister so that he hired me was my first recognition that for

scientists to get a solution is almost trivial because it is people that have to implement that solution. And our problems I think still lie with how we get the right kind of people motivated and organized to apply solutions that, for the most part, are within our grasp at this point in time.

So when I look at that system, most of the time I think it is going great, but ever so often I see a turkey and worry a little bit, or worry that I am a turkey.

MR. TURKSTRA: Now, Mr. Chairman, Members of the Board, what Dr. Baskerville has done is to take his witness statement and the statement of issues and the audit and instead of, if you like, going through them one after the other after the other, they have been consolidated into one presentation which is the reason we have the overhead projector here.

And if that's all right with the Board, he has prepared a series of overheads. He supplied me with a copy of them, I have a copy of those copies and what I propose to do, if it meets with the Board's approval, is to give each Member of the Board a copy of his overheads because they tend to disappear as soon as the lights off, and I have copies for the parties here as well.

And if that's appropriate, then maybe I can distribute those before Dr. Baskerville starts on that.

THE CHAIRMAN: All right. Mr. Turkstra, how long do you expect this overhead presentation to take and should it be done in a contiguous fashion?

MR. TURKSTRA: No, it can quite easily be broken down into stages and it is going to take probably the rest of the day.

THE CHAIRMAN: All right.

MR. TURKSTRA: The answer is, it is not a five or ten-minute presentation.

THE CHAIRMAN: No, I understood that. I was just wondering with respect to breaking for the lunch hour when it might be appropriate in your view to do that.

We commenced at 11:15, we are suggesting that we break for an hour for lunch - there is places to grab a sandwich in this building itself - and then we can continue after that. But what would be an appropriate time?

MR. TURKSTRA: Well, I think if we get through what I call the first set of overheads, Dr. Baskerville, is about a half an hour?

DR. BASKERVILLE: Yes.

MR. TURKSTRA: Somewhere in the area. So that somewhere 12:30.

THE CHAIRMAN: All right. If you would distribute those now then we can continue on.

MR. TURKSTRA: (handed)

THE CHAIRMAN: Thank you. All right, ladies and gentlemen, we will mark this book of overheads Exhibit 970.

And do we entitle this just the hard copies of the overheads of Dr. Baskerville's evidence?

MR. TURKSTRA: Yes, sir. What was the exhibit number?

THE CHAIRMAN: Exhibit 970.

---EXHIBIT NO. 970: Hard copy of overheads re: Dr. Baskerville's evidence.

MR. TURKSTRA: Q. Dr. Baskerville, going back to the transcript, and you've read that and you've seen how your comments and work has been interpreted. I gather that part of the overhead presentation that we are going through now will deal with some of the ways in which your previous comments and quotes have been interpreted at this hearing?

A. That's correct. It struck me as rather awkward to try and go through those point by point and keep track of the connection of them because

they each were out of context; they were out of context of what was on either side of them in the evidence that you had before you, and they were out of context of the way I view natural systems.

So what I wanted to do was give some overview of how I view natural systems to put whatever other questions I have to answer in context.

Q. Okay. So with that...

A. The parts that Mr. Turkstra referred to are -- how is this going to work?

Q. Sorry.

A. No, I will sit down.

Q. I could probably best move you sideways if you want so that you are looking at your screen as well, however...

THE CHAIRMAN: You might find, Mr. Turkstra, if he did hold the hand-held wand, wherever that thing went, that that would work for this.

DR. BASKERVILLE: We will make this work.

The five parts that I wanted to speak to were: First, an overview of forest dynamics, quite brief and simple; an overview of control of forest dynamics, what most people would call management; a very brief review of area regulation and volume regulation, then try to sort out the management,

adaptive management, integrated management conundrum; and finally make some comments on the summary that appears in the audit.

What I want to start with in the first one of those, the overview of forest dynamics, is some really simple definitions so that we don't confuse one another.

When I say tree, I mean tree; a tree is an individual organism that grows and dies. A stand, I normally think of here as a group of trees occupying some area, say, of the order of anywhere from 10 to several hundred hectares, but having some kind of consistent developmental pattern over time.

THE CHAIRMAN: Dean Baskerville, just before you continue on. I note that these pages are not numbered within here.

THE WITNESS: They should be.

MR. TURKSTRA: They are in some of the photocopies, Mr. Chairman.

THE CHAIRMAN: All right. Well, in any event, the page starting with the background for interpreting the audit will be page No. 1--

THE WITNESS: Yes.

THE CHAIRMAN: --and following on from that.

THE WITNESS: What shows as No. 2 is this one.

THE CHAIRMAN: That's right. And then we will just continue on numerically. And I note that some of the pages are -- there is a number at the top right that is legible.

MR. TURKSTRA: Yes, sir. And it is just the fault of a photocopier that wouldn't take the top quarter inch. The numbering seems to work starting at about page 7 and it picks up again around 19.

THE CHAIRMAN: Well, each of us can mark our own pages as we go along.

THE WITNESS: That's unfortunate. I wrote too close to the upper corner I guess when I was...

THE CHAIRMAN: That's no problem. Just so we make sure we are on the same page when we are referring to it later on.

Thank you.

THE WITNESS: This is page 3 then that we are looking at on the screen now.

Then, when I speak of forest, I mean a group of stands, stands at different stages of development or even different species groupings, and the scale involved here would be perhaps to the order

of half a million hectares, it's quite large relative to the other two.

In very brief form, as a tree grows we can expect that it will increase in height as it ages, that it will increase in diameter, that it will increase in volume and so on. There are measures, indicators of performance. For a tree you could fill in this with whatever you wanted, there are a number of measures. Weight of crown is a common one that is sometimes used, but the development of a tree as it ages can be characterized in a simple numeric form we have measured it on.

As a stand develops - and I've shown it here, this is time along this horizontal axis - as the stand develops it starts with a very large number of trees characteristically when it's young, as the trees get bigger it's simply not possible for all of them to live. So that if you look at the number of trees per hectare it decreases with age.

The volume per hectare would increase with age, as the trees get bigger they would have more volume, average diameter and so on. The point here being that, again, as the stand goes through this developmental pattern that is shown in the top line we can characterize it with numeric measures. We can

also -- we could measure it at a point in time and if we can do that we can make some forecast also of its performance.

One important reason for noting the pattern of development in a stand has to do with what is available in the stand at different periods of time. The question is: As the stand ages, what sorts of -- and changes in its configuration, what sorts of material can you get available. And what I have shown here suggests that in this period of development of a stand there is pulpwood available and, for a narrower range, you would expect to find a fair amount of sawlogs.

Now, the actual -- I purposely have not put measures for this, it's to show the principle, that we expect sawlogs later in the life of the stand than earlier. Equally we can imagine that available in the stand at different periods of its development are, in terms of deer, summer food and winter cover. The characteristics that a stand offers in terms of winter cover or in terms of summer food change as the stand ages. The ability to measure these things varies, but the principle is well established.

So if we jump from there all the way to a forest on page 9, what I have tried to do here is show

a forest now, 30 years from now, and 60 years from now without any treatment, and you can see that this stand in the upper right corner is old at the present, breaks up and eventually regenerates in the future just from natural breakup.

MR. TURKSTRA: Q. Dr. Baskerville, there are dotted lines in those drawings?

A. In here?

Q. On the ground, yes, on those three grounds.

A. Yes. Those are to separate the stands within the forest.

Q. So each of those sketches assumes that there is, if I'm correct, four stands in that particular forest?

A. That's right. It's a very pretty simple forest, it's actually the same diagram -- or the bottom one is the same diagram you saw in slide 3 that characterized the forest.

At the forest level we can generate indicators as well: We can look at total growing stock, the total volume of all trees of all types in the forest and how that changes over time up or down; the percentage makeup by stand type, how much of it is softwood, how much is hardwood, how much jack pine and

so on; and areas treated. Again, only to show that as a forest changes over time we have measures of its condition.

The slide 10 is an example of a real forest that shows how the condition might change over time. In this case, this is the percentage of the area of a property that is occupied by stands of different age-class and you can see that right now, which is here at this point (indicating), 60 per cent of the forest is over 120 years old, occupied by stands that is over 120 years old, that is this piece here (indicating), and the remaining 40 per cent is spread over seven age-classes.

This particular forecast forecasts how that forest will change in years in the future as it is harvested, and you can see that as it is harvested by the time you get out about 60 years there is from that point on roughly the same proportion of the forest in each age-class. Simply an example of a forest level indicator and the way it is used.

The pure area regulation would have resulted in these percentages being equal. This didn't happen to be area regulation which is why they are not quite equal.

Q. These are figures relating to an

existing forest that you gathered--

A. That's correct, yes.

Q. --data on, and then this forecast was prepared to show how that forest might move over time to a different quality assuming certain harvesting practices?

A. That's right, given the kinds of harvest that are invoked in this forest, that is what we can expect to happen in its continuum.

THE CHAIRMAN: Right. Do we understand that these diagrams are the result of investigations in an actual forest at some point; and, if so, are you talking about an Ontario forest, a New Brunswick forest, a B.C. forest, or does it matter?

THE WITNESS: It's actually a B.C. forest, sir, but the principle is what's important here, that we are intentionally, by the way we harvest, changing that age-class structure over time no matter what form of regulation we use.

I thought it worthwhile to show a second indicator of that same forest because it's important in terms of the dynamics, and the timing is different than it would be in Ontario or the east but the principle again is the same.

This is the proportion of the harvest

which comes from different age-classes, and what it shows is that for the first 40 years almost all of the harvest will come from stands that are over 121 years old, and that when you get out here, 160 years from now, the proportions stay relatively constant, but in the transition, from here to here (indicating), the pattern of harvest changes, the pattern of harvest by age-class changes quite dramatically.

Now, that transition has to occur. In moving from an unmanaged forest to a managed forest, no matter how we do it, someplace in there there will be -- the harvest will not come from the stands that we expect it to come from in proportion when we get out to the managed state.

MR. TURKSTRA: Q. Dr. Baskerville, can I ask you to come back to slide 10 for a minute. You referred to something about a managed forest, and is this an appropriate point to discuss the point on that forest's forecast where it moves from being an unmanaged forest to a managed forest?

A. Most people would say that it was managed from about that point on. (indicating)

Q. That's from, on that slide, from year 60?

A. Yes, but it's in transition. It's

clearly a wild forest at that point, it's in transition, but it's a balanced, managed forest from that point on.

Q. Right. For those of us who may be reading the record, you are indicating it's wild at point 0 and it's in transition from 0 to 60?

A. That's correct.

Q. And managed from there on out?

A. Yes.

Q. More or less. All right. And is the evenness of the strata of the age-classes a clue to whether or not it's managed?

A. Yes, very much so. There are no pulses in the system as there were in the second graph. In terms of harvest, clearly when you get out here the harvest will come from the older age-classes systematically every year, whereas in that -- if you recall in the graph that was No. 11, it showed that in the transition the harvest comes from much younger stands for a period of time.

Q. Could I ask you to put 10 and 11 on at the same time--

A. You sure can.

Q. --so the Board might be able to see the relationship of those two. And the impact then of

the changes in the strata has its wildest impact in that interim phase that you show?

A. Yes.

Q. And I gather we will come at some point to understanding the implications of that for people like forest industries and towns that rely on forest industries?

A. That has humongous impact for them, that period of time in there when -- as it comes into balance, is when you move from harvesting here all in this case - this one happens to be coastal forest, so this is the coastal old growth - and when they run out of that, they are going to drop down to harvesting stands that are in the 80 to 100 year range, and that means they drop down to trees that are about that size, half a metre rather than a metre in diameter. It's a pretty big jump. The volume is the same, but the configuration is quite different and to a sawmiller that is a big jump.

Q. Is this a good point to talk about the implications of averages, or do you want to come to that later?

A. I think I had it in some place further down.

Q. All right.

A. If that is all right.

Q. Yes.

A. We can -- to go back to the stand level, we can actually treat stands and when we treat a stand we in effect change its developmental pattern.

In the stand that might develop naturally, that is the same graph we looked at earlier the top one, if we were to do a pre-commercial thinning in it somewhere in its first say 15 or 25 years somewhere in that range, what happens is that there are fewer trees very early than there were here, they grow larger more rapidly and you get a different pattern of structure than you would have if you had left it this way.

So that what silviculture does is change the pattern of stand development. And if you have planted improved stock you can actually even get a bigger wind up with more volume instead of just individually bigger trees.

If we summarize that, the treatment of the stand alters the timing and amount of availability. It alters when pulpwood will be available and how much there will be, it alters when sawlogs will be available and how many logs there will be and it also, from the point of view of habitat, alters when summer food for

instance would be available and when winter cover.

And in diagram form, if you will simply overlay these, the intent is to show that by intervening - if I turn sideways can you still hear me on the mike all right - by intervening -- if this is the natural stand development and when pulpwood and logs are available and winter cover and summer food, if we intervene to space, what we do is broaden the time period when pulpwood is available, broaden the time period when logs are available, perhaps broaden the period of winter cover but narrow the period of summer food.

When we plant we broaden these again, perhaps not quite as much as there, broaden this, but almost do away with summer food. So that each treatment as it's applied in a stand will alter the availability; availability as measured in terms of pulpwood, sawlogs or form of habitat, whatever, it has an impact on the amount and timing of availability of those things. You can see that on page 14 that I just put the overlay on. Okay.

So what I would suggest then, to go back to a forest level picture, again this is the same initial little diagram of a forest is the upper left corner that we began with only this time this stand has

been clearcut and regenerated and spaced, part of it has been clearcut and planted, this natural regen here has been spaced in the interim and so on. So that it changes -- what the management does is change both the temporal and the spacial pattern in the forest. And I have suggested that the intent of management is to control the temporal and spacial pattern so as to regulate the availability of certain stand conditions.

What we would really like to do when we are managing is control the pattern in the forest so that at any time we have the kind of stands available that we want and in the amount that we want and, in principle, it doesn't matter whether you want them for a population of pulp mills or a population of sawmills or a population of deer, the principle is having the right conditions available in the right sorts of places over time.

Q. Before we go on to the second volume, you use the phrase 'the intent of management'. I had a note that the word opportunities could be used as a synonym for that. Do I have that correctly?

A. Yes. One of the first things that one would normally expect a management analysis to undertake is to look at the production possibilities: What are the possible arrangements that you could make

in space and time in that forest given the amount of money and equipment and so on that you have got and that would, I suppose, define your opportunities.

THE CHAIRMAN: Dean Baskerville, I take it that the way you are going to plan your management principles is based to a certain extent on what the objective is; in other words, if the objective is to produce a certain type of sawlog or a certain type of pulpwood you would manage accordingly, notwithstanding that the impacts with regard to other resources might be quite different if you managed a different way; is that correct?

THE WITNESS: If I could answer for me not for anyone else I wouldn't put it that way. My preference would be to actually look at the production possibilities first. I know that there are mills that you want to maintain. One of the things that we do, I believe too frequently, is focus just on what exists rather than on what could be as well.

So I would look at the production possibilities first. Clearly you are going to look for a strategy that allows you to sustain existing mills if you can, but my point in showing that we could forecast forest level indicators was to suggest that in our forecasts of a strategy, say, to sustain a sawmill that

there should be embodied those other indicators that suggest what is happening to the other things we are interested in.

MR. TURKSTRA: Q. Is there a conflict between having all the things that we want in the forest; is that necessary?

A. Is there a conflict?

Q. Can we have all the things we want in the forest?

A. At the risk of being unequivocal, yes, you can but you can't have them all in the same place at the same time. But you can have them in the same forest at different places at the same time and continously so, I believe.

Did I confuse, you, sir?

Q. No.

A. Was that clear?

Q. No.

A. Okay.

Q. I wanted to be sure I had everything that you wanted to tell us about this time and space measurement of the development of the forest. And, specifically, could I ask you to go back to the immediately previous slide the one that had the overlay on it.

A. Which number?

Q. 14.

A. Okay.

Q. It has the three lines of - that one, yes. All right. And is there significance to the curve that is dotted on that chart? There is a dotted line there.

A. Yes.

Q. Yes, sir.

A. It was to indicate relative height, relative stature of a stand. Now, this is a stand we are looking at here. (indicating) What we want is you want to have all of those things at once, you better have stands that are at that stage of development and at that stage of development always in the forest at some place at the same time.

Q. You are pointing at stands -- if you want both winter cover and summer food in the same forest at the same time, there has to be a stand at both of those degrees of stages of development; is that what I understand?

A. Yes, yes. These are exemplary, we could use any number of indicators you want. The point I'm trying to make here is that there are windows, if you want, in terms of stand development for

almost anything that we want in it. No stand delivers everything we want all of its life. It will have logs here, it will not have logs there. (indicating)

Q. And it would have similar summer food in one place and not in another place?

A. Yes. So if you want logs every year you have to arrange to have somewhere in your forest stands at that stage of development with logs available year in/year out.

MR. TURKSTRA: Mr. Chairman, that takes us through the first stage of this.

THE CHAIRMAN: All right. Well, I think it would be appropriate if we broke now until 1:30 and then returned and continued on.

We will endeavour over the lunch break to get the sound system operating properly.

Thank you very much.

---Luncheon recess taken at 12:20 p.m.

---On resuming at 1:30 p.m.

THE CHAIRMAN: Mr. Hanna?

MR. HANNA: Mr. Chairman, while we have got a moment perhaps I might just address you on the matter that we were dealing with this morning that you asked us to look at.

It appears that it is something that will

need to be brought before the Board and the other counsel have directed to me that they feel the best way to approach it is for me to present a motion to the Board and then ask for submissions on that and then a date be set to hear those submissions.

In terms of timing, there is some concern about having the matter resolved before Panel 17 in the event that questions might come up that related to the matter of purpose and what powers the Board has.

I have agreed with my other friends to refrain from asking any questions that would deal with ultimate purposes during Panel 17, and until the jurisdictional matter is resolved, we will not know the scope of evidence that needs to be brought forward. If it turns out that in fact the Board decides that it has within its powers the ability to amend the purpose, Mr. Freidin has indicated he would expect that he would call reply evidence as a result and at that time that reply evidence is brought forward that any questions that I might wish to ask or other counsel might wish to ask with respect to that matter could be asked at that time.

So if that is acceptable to the Board then I would leave --

THE CHAIRMAN: But it will of course have

a bearing should the Board so rule in terms of the other parties formulating their conditions of approval.

MR. HANNA: Certainly, Mr. Chairman, that is why we would like to deal with it as expeditiously as possible, but it doesn't have to be resolved before Panel 17 starts.

THE CHAIRMAN: Well, it may be that if a formal motion is going to be brought that we will deal with it the first day that we come back in January, which would be the 9th, and either at the end of the day or in the morning we will set a time to deal with that, and we would expect all other parties to be in a position to make some formal submissions at that time and perhaps, if necessary, we might require - we'll take a look at the form of your motion - to require written submissions as well.

MR. HANNA: Thank you, Mr. Chairman.

THE CHAIRMAN: Okay.

MR. TURKSTRA: Mr. Chairman, I am sorry. Did I get the time wrong?

THE CHAIRMAN: Well, we thought we said 1:30 but it's close enough. We happened to --

MR. TURKSTRA: I thought I was arriving a few minutes early.

THE CHAIRMAN: Well, we happened to

arrive on time for a change, so that probably threw you off.

MR. TURKSTRA: I apologize for that.

Someone since I left the room has reorganized this and that I think will be very difficult for the Board to see. Can I just fix it again?

THE CHAIRMAN: sure.

---Discussion off the record

THE CHAIRMAN: Thank you.

MR. TURKSTRA: Q. Dr. Baskerville, I believe we are going to start now on system control

A. Yes, sir.

Q. And that takes us to the next overhead and I wonder if you could take the Board through that.

A. Yes. The point that I would like to make as we finished was that as the tree grows it changes in size, if it's growing with other trees in a stand there is a developmental pattern that is specific to the kinds of trees, the species mix that are in that stand as it grows over time, and that a forest made up of stands will change over time in the pattern that exists in it; if we do nothing at all it will change, and if we manage, what we do is in fact control what is

available, alter the timing of availability of different things.

What I wanted to do was look - oh, that isn't on there - what I wanted to do was to look at an overview of the control of forest dynamics and as a leadup to how we would manage. So if we remind ourselves of stand development, it depends on -- how a stand develops over time will depend on how it's treated, but if we characterize all stands that are following the same pattern, if we characterize all of the stands that are following the same yield curve, we can put them together from a whole forest. For instance, if we look at this block here, (indicating) if we have half a dozen stands --

Q. Indicating 120, the stand age at 120? I am sorry, I'm just putting on the record what isn't going to show with you saying 'here'.

A. All right. We create an age-class. The stands that are between 110 and 120 years old would currently be at that point on the yield curve and similarly across the age range. So we can characterize the whole forest -- the part of the forest that is made up of stands following that yield curve with one developmental pattern. This ones happens to be for volume, but it could be for any indicator, and the

current position of all the stands in the forest at this point in time on that yield curve.

Q. Before you take that off can we just make sure the measurement on the left of the upper graph is merchantable volume of timber; is it?

A. That's correct.

Q. All right. And the horizontal bar is the age of each of the stands?

A. Yes, each block is the summation of the stands in the forest, in this case between 110 and 120 years old. There's a total area in the forest, according to this, of somewhere around 2,100 hectares of stands which are currently at that point on the yield curve.

Q. And if you go back to the --

A. And if we went to this one, they would be at that point and so on. (indicating)

Q. So there is no merchantable volume in the first set of stands?

A. That's correct.

Q. Presumably because they are under ten years of age; do I read that correctly?

A. Well, they are smaller than the minimum diameter used for merchantability, whatever that might be.

Q. And just to correlate that, the bars at the bottom are then the stands that are of the different ages?

A. Yes.

Q. And each of those bars represents what then?

A. Pardon me?

Q. Each of the bars, of the vertical bars of the bottom chart?

A. Each bar here represents the areas of stands in the forest at this point in time that are currently at the associated point on the yield curve.

Q. All right.

A. If we look at just one of those age-classes, if the stands are currently at 110 to 120 years old, or at that point on the yield curve, the presumption is that in the next 20 years they will grow to that point on the yield curve.

So they are currently there and they will grow across to this point; they are currently here and they will grow across to there. So that 20 years later that block of stands would appear 20 years to the right on the horizontal axis.

The mechanism I'm trying to develop here is that there is a systematic way to forecast for a

whole forest, how it will behave, if you can divide it into yield curves and age-class structures, then forecasting how it will behave, how it will look 20 years later is simply a matter of moving these over and associating the new age-class structure with the original yield curve.

THE CHAIRMAN: That is on the assumption there aren't intervening circumstances like wild fires, pestilence, that kind of thing?

THE WITNESS: Exactly, exactly.

So if I took a simple case, there is a forest now, 1989, and here's the same forest in the year 2009 without any interventions as you have pointed out, Mr. Chairman, so that that age-class -- well, the next one actually shows it.

What would happen is that this age-class would move from there to there in terms of stand development and would appear further to the right in the next diagram. So that 20 years later the pattern looks the same except the - whoops, we haven't got it in the right place - there. The oldest stand regenerates and comes back in this presumption.

MR. TURKSTRA: Q. The yield curve in the upper chart dropping at the end reflects the death of that particular stand?

A. Breakup of the stand due to old age and usually there is renewal under such stands as they break up. If they aren't hit by fire or insect, disease, wind it's common by this stage of development as the stand begins to open up and break up that natural regeneration would come in underneath, so it would renew itself.

The principle that I want to show here is that we can look at what the age-class structure would be 20 years hence and generate an indicator for the whole forest because we have all of the stands still associated with a yield curve.

Now, what happens when we begin to harvest. If we take this again as one yield curve and the age-class structure associated with it, what harvesting done is removes stands from the existing forest in some order and there is always a harvest schedule, it is either real or implied. A common one is oldest first, but there is always a schedule of the actual stands in the forest that will be removed over time.

There also is real or implied a treatment schedule of some kind and what it does is assign treatments or what treatments will be applied to the areas that are cut-over.

So if you can imagine a forest that has perhaps half a dozen yield curves in each class structure, a number of them, one black spruce, one jack pine, one mixed aspen and jack pine and whatever else, a number of those, they will be harvested according to some schedule that says take stands of these characteristics and this order over time and as they are left after harvesting there will be a sequence -- they will be assigned a treatment; well, no treatment being one of the treatments that could be assigned.

THE CHAIRMAN: How, can you predict, Dean Baskerville, what it will be over a period of time in terms of what the market demands will be; for instance, you are using jack pine for some purpose now, 30 years from now you may not require the jack pine.

THE WITNESS: Mm-hmm.

THE CHAIRMAN: You may require a different specie and, therefore, the schedule of harvesting will change and may change dramatically depending on specific market demands.

THE WITNESS: It may change because the market disappears or because a new market opens up.

THE CHAIRMAN: That's right.

THE WITNESS: And every time that happens what it does is you generate a new schedule.

THE CHAIRMAN: But that will affect your overall prediction when you are working on a rotation age; wouldn't it?

THE WITNESS: Tremendously. I have often said that if I only have control of one thing in forest management I want it to be that schedule, the determination of which stands get cut in what sequence and in what places over time.

But if the markets don't exist -- I can build a beautiful schedule, but if the markets don't exist I won't follow the schedule. That means that will invalidate whatever forecast I have made.

THE CHAIRMAN: So how can you -- I mean, isn't that the history of what has happened in fact in the past?

THE WITNESS: Not entirely. If you mean, have we continuously changed and run out of things so that we had to switch species or if species went out of favour. To some degree, but if we have chosen harvest schedules correctly we might not have done that. The problems that we encounter --

THE CHAIRMAN: Well, for instance, just as an example, has not the demand for the type of wood used in fine furniture making changed radically over the last 50 years over what it used to be at the turn

of the century?

THE WITNESS: The demand for it.

THE CHAIRMAN: In the sense that they are now using instead of the veneers and instead of the solid wood, they are into the pressed wood or chipboard, or whatever you call it, and consequently whatever demand was there would have changed within a rotation age?

THE WITNESS: Yes, that's true. We could have an interesting discussion about whether or not that changed because there was inadequate hardwood of the quality that furniture manufacturers were customary to using 50 years ago and it's not there now so they have gone to the composite boards and so on.

If we'd have built this, the harvest schedule and the treatment schedule appropriately 50 years ago they'd still have the big trees, then perhaps the composite boards wouldn't be there or wouldn't be so predominant.

You can't forecast all of those things, but as a generality, I would say that quality would have survived and that what you happened to choose was essentially a quality issue.

THE CHAIRMAN: Okay. But what you are saying is you have some confidence in (A) your

predictability and the fact that whatever schedule you are using to make those predictions will likely come about?

THE WITNESS: Yes. I think in the sense of writing this down, you have to have enough confidence that that is a place to start. The most important feature of making this explicit, as I'm showing here, is that you determine at the earliest possible moment when it's wrong.

We cannot make the future certain but we can make our forecasts explicit in a manner that makes it possible for us to detect at the earliest possible moment when we are wrong.

THE CHAIRMAN: And is there a multiplier effect; for instance, you have gone about your silvicultural prescriptions based on your prediction, you find out you are wrong, you can't changes things overnight, so it's not that easy to switch gears; is it?

THE WITNESS: To change your whole forest in direction, no, is again the robustness of management will lie largely in the design of those two things; the harvest schedule and the silviculture schedule. If they are designed right at the thin edge, then if anything goes wrong it goes very wrong.

THE CHAIRMAN: Thank you.

THE WITNESS: Am I right so far?

What the harvest schedule does is it lists -- provides a list of stands across all types and the order in which they will be felled during the time horizon of the management plan, and that usually reflects some combination of things like: We will harvest the oldest stands first, we will harvest the best quality first, we will harvest the lowest cost first, we will harvest a fixed area per year, or a fixed volume per year. There is a variety of ways that you can generate the schedule.

The schedule frequently isn't written down as it's implicit, but when models are used it generally winds up as a very explicit schedule that is easy to track down and examine.

What the silviculture schedule does or treatment schedule, it in essence assigns treatments to cut-over areas that cause stand development to follow some desired post-harvest pattern. We looked at several different patterns of stand development earlier. What the silviculture schedule does is determine what proportion of the cut-over area follows each of the various possible yield curves over time. So you can leave an area that regenerates well and

leave it alone. You can have areas that regenerate poorly, you can plant, space, thin, fertilize, there is a variety of treatments.

So if I could just go back and develop on this. We have in this case a part of a natural forest that grows along that kind of yield and that's its characterization, stands will be harvested from that and the silviculture schedule will assign them over time to a new yield curve. So that one would expect that some cut-over areas would regenerate and develop exactly the same as the original stands did without treatment. So in this case that yield curve is the same as the original one. These stands when they were harvested regenerated exactly in the same -- to follow the same pattern as the earlier ones.

Q. Dr. Baskerville, before you take it off, can I just so that the record has it clear, we are on slide 26?

A. 26.

Q. And the arrow that you have on the left chart indicates that this assumes that the harvest schedule will include only the oldest first, this is an oldest first harvesting schedule?

A. In this particular case, that's correct.

Q. Yes. And the silviculture schedule then relates to the areas that were cut-over from the oldest stand being taken out?

A. Yes. And in this particular case there has been 40 years of harvest, so there are four 10-year age-classes already that have regenerated natural.

If we don't have to press our imaginations very much to imagine that if some of the areas, cut-over areas would regenerate poorly without treatment, so that left untreated some would show delayed availability of volume and lower volume availability over time. The yield curve they followed would be not as healthy as the other stands.

Q. Could I ask you to put that and the last chart on at the same time, sir, it may be possible for...

A. I was actually going to put them altogether at the end.

Q. I am sorry, you are ahead of me. All right. Take it back.

A. I wanted to show what the possibilities were first.

One might expect that some part of the cut-overs would be seen to have natural regeneration

which was available for spacing which would allow some speeding up of the availability of certain tree sizes. So, again, some stands would wind up following this yield curve as a result of a particular treatment schedule.

And, finally, you would expect that some would be planted -- some cut-over areas would be planted so that in this case, after 40 years, there are four age-classes of plantation.

Now, if we put them altogether in one diagram it looks - I guess it won't look like that; will it? - it looks like that, and what I'm trying to show here is that stands that were growing along that yield curve with this age-class structure, that forest, 40 years of application of this harvest schedule and this silviculture schedule has produced that many acres or hectares of stands growing on that yield curve, that many following this one, that many following this one, and that many following this one.

So that, in essence, what is happening here is that the harvest schedule and the silviculture schedule take area from this forest, if you will, and on the same ground create a forest that is made up of four different yield curves.

Q. And those yield curves are -- are

they the yield curves for the areas where the plantation is, the silviculture, or are they the yield curves for the whole forest?

A. That characterizes the whole forest, what is on that graph now. Now then, probably the most important point here is that those yield curves and age structures are there in nature, whether or not we know what they are, that has happened. If we say that there is good natural regeneration or poor natural regeneration or that we have spaced, we say that this sort of pattern has occurred in nature; the issue is how well we characterize it, not whether or not such a thing exists.

THE CHAIRMAN: But it will exist in nature most likely in a different configuration than what man does.

THE WITNESS: Probably in that there would be errors in our ability to harvest exactly what we said we'd harvest. If in harvesting oldest first we decided we'd take some of the best first instead, then this harvest schedule will have been invalidated and consequently then so will the rest.

THE CHAIRMAN: Okay.

THE WITNESS: But the sources of error now, we are going to focus on the source of error being

there and there - well, we will come to that - but that is the point, is to focus on the sources of error.

So to go back: The harvest schedule orders stands based on a quantitative forecast of the volume that is believed to be available at the time of harvest. That is exactly what it does.

We have a harvest schedule either written down or in our minds that says we can get these values or these volumes over a period of time from this forest in this manner. And in most modern forecasting procedures, that is actually an explicit listing, if not of stands certainly of types.

On the other hand, the silviculture schedule takes the cut-over areas and I guess literally assigns a cut-over area to a yield curve or a yield curve to a cut-over area whichever way you prefer it, but it says the developing cut-overs, 10 per cent will go to poor regen; well, you make sure that 10 per cent of the area is forecast that way.

The objective is to forecast future development of the stands in the forest in a way that nature is actually making it happen or with your schedules you are making it happen.

So in terms of control, the control of the spacial pattern and temporal pattern in a forest

lies in the harvest queue and the silviculture queue, they determine which stands -- the harvest cue determines which stands to cut when and where - I'm on 32 now - and the silviculture cue determines how the cut-overs are expected to respond, that characterizes how the cut-overs are to respond.

So management design then consists of preparing harvest schedules and silviculture schedules that are specifically determined to provide the pattern developing in the future that you want, whatever conditions you are looking for: What species do you want, where, at what time, in what volume, and in what piece size.

Now, the message of that is that you can represent a forest in a manner that makes it quantitative and testable. If you have a harvest schedule, a silviculture schedule, and a yield curve and an age-class structure for each component, then it's possible to detect when you have deviated from the harvest schedule or from the silviculture schedule and when stands are not performing as forecasted.

So it is possible to create a forest that is a complete picture of that simple forest with its dynamics.

You should realize that the outcome of

management then would be unique to each forest. This piece that you start with would be unique to each harvest queue, would be unique to each silviculture queue and to the yield curves that you start with. And if there is a fundamental message there it's that the most dangerous thing we can do in forestry is average. If you average -- for instance, in this province I made a calculation recently, if I can remember it, if you take the total area of productive forest north of the units about Parry Sound, divide it by the reported annual area harvested, you do not need to harvest any hectare that you cut this year for another 312 years.

So on average you are in fat city, but I don't think the folks who are living in mills where the forest is receding from them or the available forest is receding from them would consider that average usable.

A characterization of a forest that provides to me a reasonable and temporary forecast would contain the kinds of things that you see on that chart, they would appear usually in numeric form in a computer program, but the principle is identical.

And those principles are these: There will be yield curves, there's age-class structures, there's a harvest schedule and a silviculture schedule. I would argue that those are present in all forests or

timber management analysis and in all forecasts of timber performance, and I mean all. When I say all, if someone makes a forecast there is implicit in that forecast or explicit, one or the other, those four things.

Someone who says we are running out of trees has in mind a yield curve, an age-class structure, a harvest queue and a silviculture queue that results in running out of trees; someone who says we don't have a problem has another set.

What is at issue is the degree to which these are stated in a quantitative form that permits first repetition so that we can examine different treatments; and, second, so that we can evaluate them. Do we accept the yield curves that the person has used in his forecasts, whether they are in his mind or written down; do we accept the age-class structure that he started with, is the harvest schedule realistic and is the treatment schedule realistic, and to evaluate management you would gravitate to those four things.

Q. Just before you leave that, you had the yield curve measured in terms of wood volume?

A. That's correct.

Q. Is that the only measurement or were you using that as an illustration?

A. No. Frequently the yield curve would reflect piece size as well. It would be even more than a single function. There is no reason why it couldn't reflect, for instance, habitat requirements for deer or whatever, as long as it's measurable and can be related to the stage of development of the stand.

THE CHAIRMAN: And, Dean Baskerville, does this analysis only work if the data for the entire forest is in a form so that you can quantitatively analyse it, or is it effective if you are going to get that kind of data for the areas for which you are (a) you are going to harvest and (b) which you are going to treat, but not necessarily the entire forest?

THE WITNESS: I would agree that it is effective when you have some database that allows you to characterize the state of the forest like that. The awkward part is, is that whether you have the data or not any actions you take or any management planning you write down presumes exactly those things, they are inescapable.

THE CHAIRMAN: For the entire forest?

THE WITNESS: That's correct, sir. If you write a management plan that says you can or cannot do something, it somehow or othger has those things in it; whether you can extract them or not might be

problematical because they are there.

My argument is, as I have said at the bottom, if they are quantitative and explicit it's relatively straightforward to see whether or not they are acceptable.

THE CHAIRMAN: Okay. I don't want to belabour it, but if you don't have the data in that form for the entire forest, can you carry out management of any part of that forest without messing up the overall prediction because you haven't got all of the data for the rest of it?

In other words, if you don't have all the data can you start out with your type of management before you have got all the data in the appropriate form; and, if you can't, what do you do in the meantime?

THE WITNESS: Obviously you can start without having all of it, but the way you will make that start is to take the part that you do have data on and kind of scope the remaining part and make some assumptions with respect to those elements for that remaining area. That you can't avoid the assumptions. Just because you don't have data, if you write a management plan for a whole forest, you make assumptions about the whole thing not just about the

part that you know about.

THE CHAIRMAN: And its accuracy or reliability will be dependent on how big the missing gap in the data is, I suppose, and how accurate your assumptions on that missing data are?

THE WITNESS: Bingo, exactly.

MR. TURKSTRA: Q. Perhaps I'm just asking you to restate it again. Is it possible to make a management plan without filling in by assumption the components, those are the four components that you don't have explicit data on?

A. You can write one without dealing with any of those. My point is that if you do so it will be possible to go back and find what they were. They're implicit -- they become implicit. If you say that you can get something from a forest by taking these actions, then those things will become implicit, I will be able to find out what they were.

Q. As the plan unfolds or as the plan is carried out, I should say?

A. Yes, and partly by just simple analysis. Where are we here. I can't lay my hands on it here.

There is a fairly simple formula that is used for estimating the allowable harvest from a

forest, and it was designed many years ago as a starting point and it says that the allowable harvest of all the annual cut is equal to two times the growing stock over the rotation and that formula used to be used frequently in this country.

And one of the - that's growing stock - one of the reasons that it was used was that there were no assumptions in it, you didn't have to have any assumptions like all this mess with the age-class structures.

In fact, if you were to plot the yield curve, the only yield curve that works for that, it looks exactly like that, it is a right triangle. (indicating) And if you were to plot the only age-class structure that works with that formula, it looks exactly like that (indicating), and no other possibilities exist for that formula.

The yield curve is a right triangle and the age-class structure is a balance evening structure. If your forest does not look like that, that formula is not a very good way to make a calculation.

That is simply an example that if you write a simple rule for making -- and incidentally this also implies that you harvest only the oldest stands first and harvest exactly the same area every year.

When you write a simple assumption about how a forest works, implicit in that will be the yield curves and the age-class structures and the harvest structure -- the harvest schedule and the age-class schedule.

Q. If I ask you a question like: Are we running out of wood in Ontario; are you saying that really is four questions?

A. I would say it was at least 117 questions, probably more like 200. I do not believe that you could answer that question except by an explicit analysis summed across units of land that were consistent with the ability to control.

So that you would have to have something like a management unit where you actually have a plan in place where you are trying to make something happen and have the ability to enforce the harvest schedule and the silviculture schedule, and if you summed all of those up you could answer that question.

Q. And at the unit level, what you're saying -- the 117 are the units, I take it?

A. Yes.

Q. And are you saying that if I ask the question: Am I running out of wood in Unit 73, that that really is four questions?

A. It would involve examination of those

four things, yes, and forecasts using those four things, put it that way. The answer to that question would be a forecast that would contain those four elements.

THE CHAIRMAN: Mr. Hanna?

MR. HANNA: Mr. Chairman, could I suggest that we have that overhead made an exhibit that Dr. Baskerville put up.

THE CHAIRMAN: The formula?

MR. HANNA: Well, because it had the graphs on it, the formula I think we have seen before, it is just if we want to come back and refer to it.

THE CHAIRMAN: Well, it is an exhibit--

THE WITNESS: Which, the Von Mantel?

THE CHAIRMAN: --it is part of Exhibit 970.

MR. TURKSTRA: The one he just sketched I think is --

THE WITNESS: You mean the Von Mantel? This thing?

MR. HANNA: Yes. I really don't have much faith in that. I don't think it's a matter of how much faith you have in it, it's just if someone wants to refer to it.

THE WITNESS: You like history.

THE CHAIRMAN: Okay. Why don't we mark that as Exhibit 971. And what's the...?

THE WITNESS: I am sure, Mr. Chairman, that no one in this room would use that formula today.

THE CHAIRMAN: Well, we cannot govern what the parties will do with that. What do you call that formula again?

THE WITNESS: It was Von Mantel's formula.

MR. TURKSTRA: The reporter is going to want to know how to spell that.

THE WITNESS: Von Mantel.

---EXHIBIT NO. 971: Hard copy of overhead of Von Mantel's formula.

MR. TURKSTRA: Q. The Chairman asked you about the reliability of forecasts when all of the data in the four components are available. In terms of forest management, is the collection of that data then a part of an appropriate forest management plan?

A. Yes. Clearly a major element of forest management should be the collection of data to improve the forecasts because you simply cannot manage except based on forecasts.

Q. Now, was the making explicit of these implicit forecasts part of your audit?

A. Please repeat?

Q. Sorry. Was the making explicit of what might otherwise be implicit components of the forecast part of your audit?

A. Certainly one of the things I looked for in the audit was the degree to which those elements had been made explicit.

Q. And do you have some view as to the desirability of that being made explicit?

A. The desirability?

Q. Mm-hmm.

A. To the extent that those four are not made explicit you can't tell quickly when you are making a mistake. If you draw those things on a piece of paper and make them quantitative, the instant that you are able to detect that reality in the forest does not match what you have got on your piece of paper, you have detected error; whereas, if you have not made them explicit, the mind has a hard time detecting error.

Q. And you made this analysis in terms of yield curves relating to timber. Can the same be done with regard to habitat?

A. Is being done; in some places, yes, it can be done. It's more awkward.

Q. Is it being done in New Brunswick?

A. A first cut is being made at it, yes.

Q. And is there a relationship between habitat forecasting and timber yield forecasting being tried?

A. The difference would be that the yield curves instead of being in cubic metres would be in terms of types of habitat and related to breeding pairs per square kilometre or some measure of population.

THE CHAIRMAN: But do you do them as a separate exercise and then blend them, or can you do a master plan at this stage with existing technology to get all your measurements in a fashion to put the four elements which combine not only management of timber but management of other resources in one?

THE WITNESS: I will come back to that, but my answer would be that I think I would prefer a thoughtful analysis from each of those approaches before you try to put it together, but having thought about the goal of putting them together.

The reason for that is that the tendency to do it all at once, there are some approaches out that you pick a goal and you put all your numbers in a great big hopper and out the end comes the answer, and there are routines that will, in fact, give you the

unique best answer given what you have fed in.

There is virtually no comprehension on the part of the manager of how that came about; he can't see the yield curves, he can't see any of the tradeoffs that were made and, in my experience, very few managers are willing to see their decision authority pre-empted by a computer, they prefer to actually make the choices and see how they are making the tradeoffs.

THE CHAIRMAN: Wouldn't you also have the problem that if you detect an error out of the big number you don't know where it's related?

THE WITNESS: Well, exactly, you have to track back through the whole thing.

MR. TURKSTRA: Q. In New Brunswick, how is the habitat yield curve related to the harvest yield curve of timber, or is it?

A. For the whole forest, you mean?

Q. Yes.

A. At this point I would say they haven't been brought together. The procedure that is being used is that a harvest schedule and a silviculture schedule are generated to suit a chosen target for volume, a target in terms of volume and quality, a separate model that at this point has really

two species groups, two separate species groups represented in it for habitat that is being gradually expanded. That separate model is then driven by that same harvest schedule, silviculture schedule to discover what the outcome would be in terms of the habitat, and then the tradeoffs are made.

If the habitat outcome that you want is unacceptable you will have to make tradeoffs via the harvest schedule and the silviculture schedule. But that's the connection between the two.

Q. Okay. Then I see at the next line that you are about to get into the question of area regulation versus volume regulation, and I take it those are two system control concepts. And perhaps can I ask you to just give the Board your understanding, or how you view the distinction between the two?

A. Yes. In really simple terms to start, the difference between the two is that in area regulation you regulate volume and in volume regulation you regulate the flow of volume. I don't mean to be trite, and it is almost that simple.

Let's first look at an unregulated forest. If we take a simple forest with a single yield curve, with a single age-class structure, and the harvest rule we will use first is no harvest and the

silviculture rule will be perfect natural regeneration when the stand breaks up.

And if I were to show such a forest, there is my one yield curve at times zero now, the age-class structure looks like this (indicating) and, as we just discussed, 20 years later everything will have moved to the right, eventually these regenerate. I think there is a diagram here - whoops, that way it won't work - this just means to show that this stand moves from there (indicating) on the yield curve down to there (indicating) on the yield curve, so that all of the stands as they age twenty years, that is what we looked at before.

Now, what I have done in this case, though, is forecast 20 years, 40 years, 60 years and 80 years into the future without any intervention. If we look at that we can also generate some forest level indicators. There is no harvest, but if you look at the growing stock, the total volume in the forest, it declines - this is time in the future across the bottom here - in the next 80 years into the future the total volume in the forest is declining even though we are not making any harvest.

And if you look you will see why. At this point a very large area of stands are very near

the point of breakup, by the time you are 20 years into the future they have started to break up, are losing volume, and eventually break up completely and begin to regenerate. So that in a natural course of events this will, in fact, come back up again over the next 80 years and the forest will just be in a continuous cycle.

THE CHAIRMAN: But you would be in a reverse situation for your next complete rotation?

THE WITNESS: That's right. It will go back up and then it will just keep cycling, if you let it go the way that is drawn.

Now, what we want to do is look at what happens with area regulation. We will use the same simple forest to start with, with the same one yield curve, the same initial age-class structure, but the harvest schedule this time will be to cut 333 hectares every 20-year period and to cut the oldest stands first, and the silviculture schedule simply says that everything will regenerate along the original yield curve perfectly.

Now, if we do that, the pattern that we generate looks like this. (indicating) Now, again, just so you see what is happening, what this says is, this time an area equal to the total area divided by

rotation age actually is harvested in the first 20 years and becomes this block here (indicating) and all the other blocks age just naturally the way they would in the forest.

In the second 20-year period another area exactly the same size is harvested, so that we have two age-classes down here now the same size, the remaining one has aged. In the third 20-year period we do this and from then on the age-class structure will remain the same forever.

If you look at the forest level output, the amount of wood harvested declines at first then increases and, in fact, once you reach this state it will remain stable forever.

The growing stock declines because it had this big block that was overmature, and gets to a point beyond which it stays the same forever because the forest structure stays the same.

The increment available in fact increases and you get it to the maximum amount and it again remains constant. The reason for that is that all the forests, all the stands in the forest are on the rising part of the yield curve in that structure that you end up with, so you get the maximum possible volume in this case.

The last indicator that I have shown at the bottom is the percentage of the forest that has stands over 60 years old, which happens to be the rotation, and it goes to zero in fifty years because after that point you harvest the stand when it gets to be that old.

So what area regulation consists of is building an age-class structure that is essentially horizontal, each age-class -- there will be exactly the same area of stands in each age-class across the entire range of the structure. It is called area regulation then because it is, in fact, the area that gets regulated.

THE CHAIRMAN: But even if you practised area regulation in all of your management units, it is dependent; is it not, on harvesting; and, therefore, if there is areas that you are not harvesting at all because it's too far away from access to mills or it's in areas where you don't need the wood, how does that impact upon the total forest structure when you can only regulate by area for part of the forest?

THE WITNESS: If, for instance, here you did not harvest the piece that was supposed to come out was about that much. (Indicating)

THE CHAIRMAN: Yes.

THE WITNESS: Supposing that you din't take that, well, what it is going to be down here is that this block is only going to be that high (indicating) and you are going to have some pieces left out here that are bigger. So the structure of forest will, in fact, be different if you change the harvest schedule, which is what you just suggested doing.

So it makes a huge difference. You need a harvest schedule and a silviculture schedule when you're making a management plan, should be realistic, you should have some belief - belief I think is the right word - that you could, in fact, over a reasonable period of time, say at least 20 years into the future, you could consistently implement those.

If we take exactly the same simple forest with one yield curve and one age-class structure, only this time we will cut 22,100 cubic metres per year from it, that harvest rule will be: Cut 22,100 cubic metres per 20-year period -- oh, no, per year it is, and cut the oldest stands first. And, again, the silviculture schedule will be perfect regeneration of all cut-overs along the original yield curve. This is a nice forest obviously that we are working with so far.

The pattern that develops here -- just so you see that it is the same sort of thing. What is

happening here again now is, you have harvested enough area to generate the volume you want because the thing you are going to hold constant in this case is the volume harvest at each year.

So I have harvested all of these stands at a very low volume, all of these also at a low volume and that many at that volume in order to get the total volume that I need for a 20-year period, and that is the area that then is regenerated.

So I now harvest as much area as I need at whatever volume it happens to support until I get the total volume I want, and that area is what comes back into the next age-class structure down here. (indicating) I keep doing that, but each time I make a harvest the stands that I harvest are in a different place on the yield curve, consequently I have a different area coming back each time and I don't build a balanced age-class structure.

Over time, if you ran this out -- I think I ran this one about 200 years into the future, and this actually does balance out, that is how I got the 22,100. What it gives me is a constant harvest level, but a non-constant age-class structure. You do not get a balance even-aged structure in one rotation, one cycle of harvest.

The growing stock goes down and comes up again a little bit, it doesn't quite balance but will as you get out in time.

Increment does the same thing it did in the other essentially, because you are moving the stands so that most of them are on the rising side of the yield curves. So if you get the young -- a forest made up of younger stands, each stand growing more rapidly, then the total increment from the forest will be higher. This does not extinguish the stands that are over 60 years old because some of them escape because of the different area that is harvested each year.

So in volume regulation what you get is a constant volume harvested, but not a constant area. You can have one or the other, but unless you happen to be lucky enough to start with a balanced forest, you can't get the two together.

Q. Dr. Baskerville, if you are going to come to it later, that's all right, but I notice that the difference between the harvest curve in slide 41 and the harvest curve in slide 44 is the dip.

A. Yes.

Q. Are you coming back to that or can you just identify that or can you confirm that, from a

point of view of timber harvest; that is, the consequence of the two different --

A. That is exactly, I mean -- well, there are two things that are different. That's the area regulation overlay and if I lay the volume overlay on it you will see that the difference is in the - oh, this overstates it because I missed it, there - you will see that the volume harvested with volume is lower than you get with area, in fact, a sustainable one because it's -- the way I calculated the volume that was harvested was the maximum that was sustainable in any period and since that period limited it, that's where it came out.

The others stay relatively the same. This goes up a little higher and you have a higher proportion of old stands escaping. (indicating)

Q. And there also seems to be a difference in the characteristic of the age classification in the bottom right-hand corner?

A. Oh, yes. Yes.

Q. The one ends up at the end of 60 years being a uniform age-class structure; is that correct?

A. Yes.

Q. And the volume regulation ends up

with being less than uniform age-class structure?

A. Exactly.

Q. Are those the principal differences between the two?

A. In some those are the differences. You use -- you have a choice of coming to an absolutely balanced age-class structure and accepting some variation in the volume produced while you are doing that, or you can have a constant volume produced and accept some variation in the time it takes you to get to a balanced age-class structure. The target is essentially the same in the two, but there are some differences in the path.

To go back, the area regulation then focuses on the age-class structure of the forest, so it is the structure that it regulates, it builds you a balanced even-aged structure.

The volume regulation focuses on the volume of harvest, it's the flow of volume that it tries to regulate.

Q. Can I stop you there for a minute. Which of those two concepts, as far as your examination at the time of the audit, was practised in Ontario?

A. Which does Ontario use?

Q. Yes.

A. Area regulation.

Q. All right. And as part of your work were you able to determine the source of that; where it originally came from, the concept?

A. It's essentially a European approach, well documented, probably with a century of experience in some central European forests. Some German forests would have a century of that kind of management in them.

It's not common in this country -- well, depending on how you folks in Ontario view it, it may be very common since you are one of the larger provinces, but it's not used in other provinces.

Q. And what is the relationship between either of those two to, for example, mill capacity?

A. The way I have stated them, none, but most certainly when you are making the calculation it would be prudent to determine what I have said, examine production possibilities with whatever one of these forecasting tools you use, it would be prudent to look at what kinds of markets you believed you had before you chose a level of harvest from either form, because if you make a forecast for one level and the mills only operate at half that level, you will not control forest dynamics the way you thought you would, your forecast

will not be valid.

THE CHAIRMAN: Are you going to indicate to us which is preferable or why some provinces use one and some others, other than just a historical reason?

THE WITNESS: I had not. Would you like me to try?

THE CHAIRMAN: Well, I am just wondering. I assume New Brunswick does not use area regulation?

THE WITNESS: No, they use a form of volume regulation. All of the other provinces use a volume regulation that would all look to see if they were approaching a balanced age-class structure. You keep looking at that age-class structure no matter what approach you use.

I would say that historical incident, I think people like Walter Plonski and John Morawski and Adrien Van Friessan with their backgrounds probably implanted -- transplanted a European idea, but that may be an oversimplification. I am sure there are people here that can give you a much better idea of how it arose here.

THE CHAIRMAN: And once you are into one form of management, is there any valid reason for trying to change it to the other?

THE WITNESS: I could not answer that

question except in a specific case. I am not waffling, I really would like to a see a case because I think my answer in some cases would be yes and in others would be no.

It is very easy to get yourself in a position where to switch from one to the other would cause a rupture in the flow of volume, if you were going from volume to area, or a rupturing of control of the land base if you were going from area to volume.

MR. TURKSTRA: Q. When you say 'a specific case', did you mean a specific unit?

A. A specific unit, yes.

Q. So that I take it that's a question that you would want to answer in relation to one or more of the specific 117 units that are of course management units?

A. Yes. I will come back to that when I speak to the summary.

THE CHAIRMAN: Is it usual, Dr. Baskerville, in a particular province or jurisdiction to have both types of management concepts in use by the same regulatory authority on different units?

THE WITNESS: I don't think I know of a case where that is true, no. There is no reason why it couldn't be; technically for sound reasons it could be

that way.

MR. TURKSTRA: Q. When you examined the manuals, what came out of the manuals in terms of which system was built into the manuals?

A. Exclusively area regulation. The manual is built that way, that's what it is. As I have said in the audit and will say again, it's the finest example of implementing area regulation that one would imagine. The structure is virtually ideal.

Q. When you had completed your study was there some discussion about this?

A. The difference between area and volume regulation?

Q. Yes.

A. Yes, because one of the principal concerns I had was that the area regulation forecasts did not embody a volume forecast. What had happened in very simple terms was that these forecasts were made, but not this one. (indicating)

So that these forecasts are made explicitly, but that one wasn't made explicitly, although it was possible to make.

Q. Just from a practical point of view, if I can ask you to leave that on for a second, what's the practical consequence of the absence of a volume

forecast?

A. Supposing that it was possible to cut the exact area that was supposed to be cut each year and that this age-class structure did evolve, the volume available for mill use would follow that pattern. If your forecast -- if that yield curve was correct, this initial age-class structure was correct, and if your harvest schedule and silviculture schedule were as I defined, then that is what volume availability would be.

MR. MARTEL: That would even out though?

THE WITNESS: Yes, it evens out right there, sir.

MR. MARTEL: Yes.

MR. TURKSTRA: That's at about 180.

THE WITNESS: Once the age-class structure is balanced that will stay constant.

MR. TURKSTRA: And that's at what, about?

MR. MARTEL: That's in the short run?

THE WITNESS: Yes. Well, short run, that's --

MR. MARTEL: Level, forty years.

THE WITNESS: Forty years. For us young fellows that's short run.

MR. TURKSTRA: Q. So that if I can get

back to that, in terms of its practical implications, for example for a mill, I take it that that would require an adjustment then from the mill to the volumes?

A. The mill, of course, would make that forecast. On the FMAs that forecast existed explicitly, although it didn't have to be part of the management plan and, I guess, was never shown in one of the management plans. In the three that I examined it existed, they had it, they had made the forecast.

Q. The mills had?

A. Yes.

Q. But --

A. The FMA holder had.

Q. In the forecast that you had seen for the units by the Ministry, the volume forecasts, were they there or were they not there?

A. They were not there, but it was relatively easy to make them. There is a table in the audit that makes forecasts using the same model that was used to construct the area regulation rule and I had the - I guess, volume is there, but it's by working group, it's not by species - and what I had them do is disaggregate that down to species, so that you could look at what the species flow was rather than the flow

of volume undistinguished as to species.

Q. So you were able to get a volume forecast in the units that you worked in?

A. Yes.

Q. By specie?

A. Yes.

Q. From the material that the Ministry had available to it?

A. Using their model and exactly the same database.

Q. And that, as you said, is a table in Exhibit No. 16?

A. Correct.

Q. Perhaps you can direct the Board through that?

A. It's on page 38 and 39.

MR. FREIDIN: What page was that?

THE WITNESS: If you look at the top one for the Plonski Forest, what it shows by five-year periods 86-91, 91-96 and so on, is the volume in the first line of jack pine that would be made available by harvesting a constant area, as the harvest rule used in the area regulation determined, that is the volume of jack pine that would result from applying that particular harvest rule, it would result in a balanced

area, but a declining flow of volume over that time period.

Q. Do I understand that, in other words, this model would produce a forecast for jack pine; that using the same area for harvest there would be 63,000 cubic metres thereabouts in the first five-year plan, but by the time you get to **2016 you are down to 51,000 and by the time you get to 2021 you are down to 39,000?

A. That's correct.

Q. Right.

A. That's again using exactly the forecasts that were in the management plan, but simply extracting the species volumes out associated with the areas and the points on the yield curve that the stands were scheduled to harvest.

Q. And then the next categories are the same thing?

A. Yes.

Q. It was done, for example, for spruce --

A. Jack pine, spruce, fir, conifers together and poplar.

Q. And, for example, poplar would then decline from 52,200 to 17,400?

A. In that unit, yes, with that harvest schedule and with that silviculture schedule.

Q. Under an area management regime?

A. Correct.

MR. MARTEL: Could I ask a question? What is happening in there then, because all of them over the periods have declined significantly by the amount of harvest, what is the end result then, Dr. Baskerville?

THE WITNESS: What that means in the cases other than Plonski - it's a little more complicated - but in the other ones it means that the initial age-class structure was older, essentially most stands were older than rotation age.

So that over the period of time while you are getting the forest balanced you are actually harvesting stands that are lower while you pick them up, you harvest more volume to get the area that you want; the other way around, you are harvesting less volume to get the area, constant area. It has to do with the age-class structure that the forest starts with. Here, we got it right here. (indicating)

MR. MARTEL: And then you are coming up with a more --

THE WITNESS: What you are doing is

picking this up, and what you are looking at is that piece right there. (indicating) You are harvesting a constant area, but you are harvesting them, because they are old stands they are at a low point on the yield curve, so you are looking at this. (indicating) If you extended those out, I would expect them to rise and become constant.

MR. TURKSTRA: Q. So if we go to the --

A. I don't think in any case there the rotation age, that's only what, a 40-year forecast, and the rotation ages are all in the order of 80 and higher. So you would have to go out twice as far as this to get the balance.

Q. And if we go to Iroquois Falls then for a minute.

MR. MARTEL: Could I just ask you one more question?

MR. TURKSTRA: Sure

MR. MARTEL: Could you run out, let's say by the year 21-26, and you have not reached it because it's a 80-year rotation period, would you fall short of wood possibly in that last 40 years, or could you?

THE WITNESS: Could you?

MR. MARTEL: Yes.

THE WITNESS: Yes, sir.

In fact, if you look in the very first column the actual harvest in the period 81-85 was 87,358 cubic metres. That is the actual scaled volume reported. So, in fact, you can't meet that, the mills won't operate at that level, and by the harvest rule and the silviculture rule that are in place in that management plan, the volume delivered would decline below the current level.

MR. MARTEL: You'd have to pick it up from somewhere else--

THE WITNESS: Exactly.

MR. MARTEL: --to meet the mill's requirement?

THE WITNESS: That is almost certainly what would happen.

MR. TURKSTRA: Q. So we go to the Dryden Unit, the actual mill activity for conifers would be on the basis of 42,200 square metres in 81-85; is that correct?

A. That's correct.

Q. And you are saying that in the period 91-96, it would be more than double the volume harvested of that particular variety?

A. And I think the point that the Chairman raised is relevant here, in fact, if 42,000 is

what could be processed because that is what would be harvested, which means that that is not a valid forecast, it wouldn't happen that way.

Q. And similarly for poplar, on the area management in 81-85 there was 23,000 square metres -- I am sorry, cubic metres, and if we go down to the mid-90s the forecast, using the Ministry's figures, would be 35,000.

A. That one is a little different. What might happen there is the poplar would be left standing, you could cut around it. But in the case of the softwood species, where it would really drive the mill consumption, you would not cut in any one year more than the mill was going to use.

Q. I take it there is not a similar forecast for those units on a volume area regulation basis -- on a volume regulation basis?

A. Not to my knowledge, no, but I guess there is now for at least one of them, I am sure Plonski has one now.

Q. I take it from your answer that there is some work being done on volume regulation in Plonski at the present time?

A. More of a direct forecast. I know there are places -- several places in the province

where they are looking at making volume forecast directly associated with the area regulation so that the two are linked. It was identified by the Ministry correctly as one of the five key issues in the audit.

Q. Do you think it would be helpful to our understanding if you were to try to take jack pine, for example, in Plonski and indicate what the difference might be if the management plan had been by volume regulation rather than by area regulation.

Is that reasonable to put to you today?

A. Without running it, I am on dangerous grounds. My suggestion is that you would probably discover that the sustainable volume harvest was probably somewhere down around 40,000 if you did it on an even flow basis, because that is what it is when you get out their way. So that you would, in fact, have concluded that you could not make that '87 -- '85 harvest figure. That is the kind of trade-off that would be involved.

Q. Does that have any impact on the relationship -- did you find it had any impact on the relationship between industry and the Minister?

A. Yes, substantially. The industry are fond of saying that their mills process solid wood, not hectares, so that they have to have -- they work with a

volume unit because that is what they deliver to the mill and all of their costing is based on it. It simply means that there has to be an accounting system that covers volume somewhere where they are involved because that is what they use.

Q. Can either of those systems work without a reporting of results?

A. Can either system work without a reporting of the results?

Q. Yes. What feedback is required to make either one of them work?

A. I would say that the minimum in area regulation is to record the area you have actually harvested so that you can see whether or not the real forest is approaching a balanced age-class structure: Are you harvesting what you forecast you would harvest.

And in volume regulation the minimum feedback would be to -- again, in my view, would hinge on the harvest schedule: Are you harvesting the stands you forecast you would harvest at the volumes you said you would forecast.

Q. And in terms of the -- I am sorry, I interrupted you. I think you were about to go to 46, I think. I'm going to let you finish.

A. Just to tidy up a couple of things.

If you look at area regulation in really simple form, what you do is take the whole area of your forest, or at least of the part of the forest that is made up of one working group or species, and you divide it by the rotation age and that gives you the area that you can harvest each year which, in fact, if you harvested it each year you would bring the forest to a balanced age-class structure. So it is a really neat simple picture that way.

Q. It terms of administration from a bureaucratic point of view, how would you rate that?

A. I guess in terms of implementation if it's feasible to implement so that you are in fact controlling the harvest schedule and the silviculture schedule on the scale that the Germans do, yes, it's a feasible system.

If we look for a moment at the risk such as it is in area regulation, that is the same graph we were looking at earlier, is that in fact the unspecified silviculture rule fails. And I just wanted to suggest for a moment what it might look like if, in fact, the stands that regenerated did not follow the original yield curve, but say they followed one as poor as this one (indicating), and say that only a third of the area did that - I have a hard time getting my

graphs in the right place here - if a third of the area followed -- when it was harvested followed this pattern of growth rather than the black line, that would mean that this area at year 20 was, in fact, following the red line; by year 40 this area of stands would be following that one, and so on.

You would still get a balanced even-aged structure. The end result here is exactly the same in terms of the area; the different is that the portion that I have shaded red here is actually growing on that yield curve instead of that one (indicating).

The impact of that, if you look at the forest level forecast - and my overlay isn't accurate - but it should follow exactly on that line out to there (indicating) and then the harvest level would be lower, and it will be lower at the point where you begin to harvest some of these stands which are growing on the red yield curve. Similarly the growing stock will balance at a lower level and the yield will balance at a lower level.

THE CHAIRMAN: But if you cut down your harvest to compensate, to let the regenerated part catch up so to speak, to get to an older state before you harvest it, you could bring it back into sinc; could you not?

THE WITNESS: Well, the way I have drawn it you couldn't, sir, because this yield curve never goes as high as that one--

THE CHAIRMAN: Okay.

THE WITNESS: --if that were not true. But what I've put up is a strawman, in any event. I simply wanted to introduce why you do that. In fact what happens in the Ontario system - I tried to do this in diagram form rather than a figure - but if that's...

MR. TURKSTRA: Dr. Baskerville, can I just inject here. For the record, this is table --

THE WITNESS: 49.

MR. TURKSTRA: 49. Thank you.

THE WITNESS: If this is the total area of the forest say in the year 1985 and we have a value of rotation called "R", then the harvestable area is A over R and it would be this little red square here.

Now, the way the system works is that when you come to 1990, that piece you harvested is no longer part of this base forest. So A prime is smaller than A, R is still the same, so the harvest area comes out to be smaller in the second period. So it's adjusting, it's saying that -- and I will show you what happens.

In the next one, a portion of that first

cut-over has regenerated sufficiently that it has been designated free to grow, so it appears back in the original land base, the part that is free to grow, and you divide A double prime by R to get a new area which is harvest and so on.

So that over time this harvest eventually -- harvested area at this first period eventually is all back in the land base when it is free to grow. So that if there is a problem with regeneration it is captured very quickly and my 40-year forecast wouldn't happen, by the time you got to here it is already taking the piece of the land out until it has been regenerated and shown to be free to grow.

It is, I thought, a really neat protection. That is what that diagram is all about. And what it says: Here's harvest schedule here in the red line, and the silviculture schedule or equivalent of it is the green here.

MR. TURKSTRA: Q. Dr. Baskerville, the people who are working from the photocopy we made won't see the text under the words "Depletions From MAD Base" and perhaps I can just tell everybody for the record that --

A. It's the figure on page 17 in the audit and these are harvests under the "Depletions from

MAD Base", harvest by man and natural harvest by burn, insects and other.

The MAD base is the total area that is available in any five-year period into which you divide R to discover how much area you can harvest per year. What this says is that once you take area out via the harvest schedule, the only way that area can get back into that base is to pass a five-year stocking and a five-year free to grow assessment.

Q. Could I ask you to stop for a minute and tell me how you produced that? Where did that chart come from; was it something the Ministry gave you or did you generate it?

A. It got produced from reading manuals until I had tracked where all of their accounting -- the accounting system for a hectare actually works like that and, if you track it through, that's the diagram that I came up with. It was verified by Andrien Van Friessan the gentleman who is the author of the manual.

I am reasonably confident that it reflects what happens and when I examined in the audit to find out whether this land when it was harvesting was finding its way back in there or whether it went this way, in every case the system did appear to work.

MR. TURKSTRA: Mr. Chairman, does the

Board want Dr. Baskerville to go through this in any more detail, or are you content with it?

THE CHAIRMAN: I think we have gone through this in some detail with the Ministry--

THE WITNESS: Okay. That is all I wanted to say.

THE CHAIRMAN: --how they calculate the land base. I do not think it's necessary. But I think, Mr. Turkstra, we should consider taking a break at this time to give the reporters a break, as well as everyone else.

If we could take 20 minutes and we will return at that time.

MR. TURKSTRA: Thank you, sir.

THE CHAIRMAN: Thank you.

---Recess taken at 3:02 p.m.

---On resuming at 3:30 p.m.

THE CHAIRMAN: Thank you, ladies and gentlemen. Please be seated.

We are ready, sir.

THE WITNESS: If we could go back to that little calculation for a moment. What we just looked at was how the Ministry at the time of the audit had a control on area, so that the area that's in that division is in -- there is protection against things

like poor regeneration.

What I want to look at now is the notion of rotation age. In a classic sort of format, the rotation that foresters talk about frequently is the maximum production per hectare per year and that will always occur at the tangent line there (indicating). And in this case, if R equals 67, it means that the mean annual volume increment, the volume at that point divided by that age is as large as it will be at any point on that curve. And that's the sort of standard form for using -- when people speak of rotation in forestry, that's probably the traditional form.

Now, if we stick with the traditional form and keep away from economic forms and whatever, there are for each on the same stand type, if I could, if that is the yield curve for biomass, raw fiber produced on a hectare, and in this case it will start from age zero, and if we count every leaf and twig that's on the forest, we would get a line that looks like that. (indicating)

And if we calculated the rotation for biomass, that point of maximum mean annual increment happens to be right where I am pointing now (indicating), somewhere around age 32 it says.

If we look at the portion of that biomass

that is actually in trees that would make pulpwood, there is a delay here (indicating) because it is some time before the trees are big enough to make pulpwood, and then not all of the biomass that's in the stand at any point in time would make pulpwood, so you wind up with a pulpwood curve that is lower than the biomass curve. And, again, a rotation in this case at 65 years, but that's the point where for pulpwood the maximum mean annual increment is attained.

The portion of the biomass that's in sawlog forms is again smaller than that which is in pulpwood, and the rotation for that in this case is 105 years and veneer logs, which is an even more restrictive form of wood, would be 140 years. The point there being that the rotation that you choose is dependent on the product that you are looking for.

The second point that I wanted to make in tidying up this part of it, was that if that's where the rotation is in terms of maximum mean annual increment and you have this age-class structure to start with, which is not an improbable situation, you could easily -- I looked at units which had age-class structures that went more than twice as far, twice as old as the rotation age.

If you look at that you will see that

with an oldest first harvest rule virtually every stand that you harvest in the first rotation will not be taken at rotation age. The first stands are going to be taken at more than double rotation age, and if you use an oldest first rule, the first stand that you actually harvested at rotation age would be in about the 60th year in the future when you brought the forest to a balanced even-aged structure.

Now, the reason for pointing that out is that rotation is the target that you use, it's part of the formula to determine the rate at which you harvest, it doesn't mean the age at which the stands are going to get harvested.

Only after you've got all the forest blocked down here so that it is balanced even-aged structure will you be harvesting at rotation age. In the transition to the managed state you have got to harvest all of these first and none of them will be taken at rotation age.

There was some confusion I noticed in the discussion with respect to that.

So if I could just summarize in that, that area regulation, certainly as it was applied by the Ministry, doesn't give an even flow of raw materials but it does provide a controlled transition

to a balanced forest structure and it does provide protection against poor response of cut-overs.

MR. TURKSTRA: Q. Before we leave that, you mentioned that - I am not quoting you exactly, but the equivalent - that the regeneration that actually occurs on the ground may not follow the theoretical regeneration and, therefore, doesn't follow the assumption in area regulation, and I take it that that was a part of your audit?

A. Yes.

Q. And did you make a recommendation with regard to that?

A. Not formally. In fact, the figure - if I could borrow yours, sir, you happen to have it open - the Figure 3, it appeared to me that no one could ask for a more stringent control of the entry of a cut-over hectare back into the MAD base than that provides and I didn't suggest any change in it.

Q. All right. So you were content with the feedback on the way in which regeneration might depart from what theoretically would occur?

A. Yes.

THE CHAIRMAN: Dean Baskerville, looking at your conclusions on page 54, if as a result of your audit it did not appear that there was an even flow of

raw materials, although there was controlled transition and protection against poor response of cut-overs, can the first one be adequately dealt with, the even flow deficiency, by making up that flow from other units?

THE WITNESS: That would require me to know what the other units were producing. My answer would probably be yes, if you looked at it. The gut feel is that the flexibility is there.

Actually, I believe that maintaining the area regulation approach and superimposing a volume forecasting scheme could achieve what you are after, you would see what you had to give in terms of area control to make it happen.

MRS. KOVEN: Dr. Baskerville?

THE WITNESS: Yes, ma'am.

MRS. KOVEN: What was your evidence that there isn't an even flow of raw materials? Are we talking about what is going to the mill door, or are we talking about even flow in terms of the structure of a forest?

THE WITNESS: Even flow in terms of what would be available for harvest year by year into the future if - the 'if' is important always - if the harvest schedule and the silviculture schedule that in the plan are followed.

MRS. KOVEN: And that's not delivering today?

THE WITNESS: That's correct.

MRS. KOVEN: Okay.

THE WITNESS: It's what shows in the table that covers two pages. What actually is delivered to the mill will be what the mills can use in any one year; they won't take more or less.

MR. MARTEL: Which in itself is not necessarily an even flow of material?

THE WITNESS: Almost certainly is not, sir. Yes, I agree. Which means that there will be -- the system has to be capable of being a buffer, it has to be buffered against an uneven demand from the consumption side.

MR. MARTEL: Well, even when you get it all down in the final analysis then to an even flow, depending on demand you might not cut an even amount even after you have got the controlled forest?

THE WITNESS: That's correct. So that again I would argue that what we are talking about - I use the word dynamic frequently in this - you are talking about a dynamic system and control of a dynamic system over time, we won't ever get it to that gorgeous static state in my area flow diagram or any of those

forecasts.

Something will go wrong with the forecast, we will fail to be able to implement a harvest schedule before we get 80 years into the future. What we need is a system that allows us to detect as soon as possible when that deviation from the forecast has occurred so that we correct for it.

It is like driving a car. I have often said that I would not want to drive down Yonge Street with somebody who started south and said: We have driven for 11 minutes and 33 seconds, we must be to Bloor Street, I am going to turn right. I would rather that he watched, had a look at the street signs and when he got to Bloor Street he turned right. That's the difference.

I have to go home with my lawyer tonight, he is going to turn on to Bloor Street.

MR. TURKSTRA: Q. Hopefully. Is there a common goal of either of the two systems of regulation, either area or volume regulation that you are able to express?

A. A common goal?

Q. Yes.

A. Both systems aim at bringing forest structure to a situation where you can get a consistent

flow of -- have consistently available the characteristics in the forest that you want and the characteristics can be in terms of veneer log, sawlogs or whatever, some mix of those things usually.

What regulation is aimed at doing is bringing the forest to a structure so that someplace in the forest, year in and year out, there will be the kinds of conditions that you want, whether those are conditions to harvest or conditions for populations to live in.

Q. I take from the last answer that what you have said about these two systems of regulation has implications for both habitat management and timber harvesting?

A. Yes. It doesn't matter how we intervene in the forest, we intervene in both the -- once we change its structure, the dynamics of the forest structure and how that's changing over time, we are going to influence the availability of wood and of any other value that we take from the forest.

Q. Can you summarize then before you move on to the next what the fundamental difference is then between volume regulation and area regulation?

A. Okay. That area regulation aims at regulating the area harvested each year so that the

forest structure will be brought to a completely balanced form; that is, the same area in every age-class in usually the shortest possible time which is exactly R years, is the shortest time it can be done.

Volume regulation aims at maintaining some defined flow of wood and usually a quality constraint on that into the future.

Q. Are we going to hear something about how this relates to adaptive management?

A. That's next.

Q. That's next. Before we leave this, do you have any observation how area management might have been treated the same or differently at different levels of the Ministry?

A. Yes. There is - one of the things this caused me to do was to actually read the audit again myself - there is a quote in here from Adrien Van Friessan actually who said that he wrote the manual with the idea that it would structure the reporting of how management decisions were made. And I thought it was very -- every time I looked back at my notes and saw that as I read this, when you went to the bottom of the system the guy who was designing it, the unit forester level, that clearly was pretty much what he

had in mind, he knew that he couldn't move all the wood in any given year if the area regulation said: Cut a thousand hectares and only 500 was needed to fulfill the mills. He knew those problems, recognized them and was looking at ways to report.

But when you take a structure, a bureaucratic structure as large as the Ministry, there is a piece in the middle that's neither sitting next to the man where Van Friessan was, as a sort of a designer, nor are they sitting at the forest that face the realities of mills that don't use as much, and essentially at the regional level that manual became the law and it wasn't a way of reporting, it became a way of doing it. If you hadn't done it so that it was just done that way, you got in -- whoever did it got into endless letter writing back and forth over decimal points and that sort of thing.

So, yes, there was an interpretation of how the thing was to work. It was quite different at different levels in the structure.

Q. Did that result in some conclusions about the role of the unit forester?

A. It sure did, yes. I think that the one thing that I felt very strongly about was that the person -- a person be established with some

responsibility, some substantive responsibility for the control of a particular unit and that he be held responsible for the way that unit was managed.

THE CHAIRMAN: And that would be the unit forester?

THE WITNESS: In my view, yes, that's what I suggested because he was in place and he was the person on the ground.

MR. TURKSTRA: Q. And how did the -- in the end result, how did area management get treated at the provincial level as opposed to the local level?

A. At the provincial level, it disappears actually, I think would be the fairest thing to say, partly because it doesn't really make sense to aggregate from 117 units, to aggregate up and show a balanced age-class structure, an average one. Again, it wouldn't be very realistic.

But more particularly that the production targets, the volume production targets, the ones that were shown to me I believe were about 10 years old at that time, the newest of them, had not been constructed on a unit-by-unit basis in aggregating upwards, they had been the -- from area regulation, they have been determined independently on a basis of production for hectare or some such algorithm. It was not always

clear what the algorithm was.

THE CHAIRMAN: And are you suggesting that that's appropriate?

THE WITNESS: No, I would not suggest that that's appropriate.

THE CHAIRMAN: You are suggesting it should have been aggregated?

THE WITNESS: Definitely. The production possibilities are going to be constrained primarily by the piece of ground where you have a manager in control and a set of mills that's using them and you have some realistic mix between the two, you can see what you are doing. If you add those up you can get a production possibility at the provincial level.

I don't think you can do it the other way around. Well, you can, but I don't think it's realistic.

MR. TURKSTRA: Q. Have we covered those two areas then?

A. I believe so.

Q. All right. Can I take you then to adaptive management/integrated management, I think that starts at page 55.

A. Okay. I find it simplest to think in terms of management as a designing process only because

it's a dynamic system, it's a continuous design or control, if you want.

The objective is to control system dynamics so that the conditions that we want are available in the places we want at the desired times and within the desired amounts in the future. So that the goal always has some elements of those things in different weights.

For timber, the desired conditions usually get specified in terms of form of raw material and cost of delivery but, in any event, the key is that management design is going to be future oriented; it's always based on forecasts, temporally and spacially in response to a set of management interventions.

I say 'always' and I mean 'always'. It may not be possible to see what those forecasts are if they are made in someone's mind, but they are made in exactly the same context; in fact, they are perfect analogues that a decision is always a choice between two forecasts, two or more.

A decision isn't a choice of fact, it's: I think I will go to a movie tonight and I have two possibilities to go to, and I make the choice based on a forecast of how I might feel after movie A or how I might feel after movie B or whatever, where it is, how

much. There is a forecast involved in any decision. And, in fact, a decision by definition in a technical sense is a choice between two forecasts, it's choice in the face of uncertainty is Rafis' definition of a decision.

Management is exactly the same thing; you look at a set of forecasts and decide which one you are going to try and make the future look like.

So in that context, if you think of it as a process of system control, the process consists of a number of steps. The first one is what we've just done; you would characterize the system structure, the dynamic structure of the system so that you had the yield curves, the age-class structures, harvest schedule and the silviculture schedule and you would make them as implicit or explicit as you could.

Once you have characterized those, a standard sort of approach would be to generate what I call some reasonably possible futures. You make forecasts that you believe could be possible given the kinds of control - the Members of the Board have noted, that you don't always harvest all the wood you want, you don't use all the things - so given those kinds of things, what are reasonably possible levels of control, where are the places we might be able to get to.

The issue here is that these forecasts be based on as reasonable a dynamic basis as we can generate and the richness of the case is examined. We have a tendency I believe in our profession to say that what we want is maximum volume production or area regulation and stop there and get that one answer and apply it rather than look at a broader array of reasonably possible futures. The textbooks tell us to do the latter, but when we get doing it we become too busy.

From that array, one forecast is chosen, that becomes the objective. Now, there is obviously going to be a cycle there. You probably had an objective in mind when you started looking. There will be some balance there. The choice is going to be based on what you want in the future but also on what you believe you have the capability to make happen and on the cost of making it happen, because the available cashflow is going to limit some of the things that you can do.

The harvest schedule and treatment schedule associated with that forecast that you choose as the objective then become the one that you would -- ones that you would try to implement in the forest in order to make that future unfold out there. So as you

gentlemen have pointed out a couple of times, the success will depend on the degree to which, in the forest, we can actually make those two schedules happen.

Usually we design management for a long time horizon, 50 years wouldn't be uncommon, 80 or 100 years are common time horizons that you would look forward in time while you are making the choice to make that first five-year step. You would always look in area regulation, all the forecasts I saw went at least R years into the future. So if R was 80 years, there was at least 80 years into the future in the forecast.

When it comes time to actually implementing, we do it in shorter steps. We take five years and we say: How would we actually build, which stands would be in the harvest schedule, which stands would be in the treatment schedule, how would we do, where are they, what do we actually do, and that's a shorter step.

In doing that, there has to be an assessment of the yield curves in the forecast versus actual five-year performance, there has to be an evaluation of the age-class structure.

Even when we start, we don't have -- as you asked earlier, Mr. Chairman, if we didn't have all

of the stands categorized by age could we start. My answer was: Yes, we would start, but what we would do is somehow or other assign them either explicitly or implicitly.

In the five-year step, one of the things you do is begin looking to see whether the stands you are actually harvesting are the same age as the ones that the forecast said you would be harvesting, the degree to which the schedule, you can actually implement it spacially and temporally; the degree to which the treatment schedule can actually be implemented is examined in each of those five-year steps, and then the deviations in an operating plan, a five-year operating plan would ask that the deviations in those five be examined and, as has been noted already, is that where those deviations occur they in essence invalidate the forecast.

So the crucial issue here isn't whether the planned actions were carried out, but rather did the actions have the planned effect on forest dynamics whatever the actions were. We need to know not just: Did we do the number of things we said we would do, but did we do them in the way the forecast said they should be done, in the places that the forecast said they should be done, and with the effect that the forecast

said they should have.

If we go to the last step then in the design process, to the extent those actions are carried out -- or weren't carried out rather, or they did not have the planned effect or the original formulation was in error, all the questions that you have raised, the process -- the forecast will be incorrect and the process is repeated by going back to step 1 and saying: Now that we have found that we didn't get it right five years ago, we can fix those things and we make a new forecast, and the rolling five-year forecast thing sort of looks like this. (indicating)

We might examine formally in a 20-year management plan that had a much longer time horizon to it but reported on the first 20 years, we try to implement these five and then at that point you repeat the whole process in a forward-looking step. And these steps are done intentionally so that each time you are looking further into the future and presumably correcting for anything new that we have learned at that step.

The process that I have just described I think you would find in any contemporary forest management text and it has been in text for many decades, and over the weekend dug out the oldest

textbook I had and the newest one I had. The oldest one is dated 1949 and the newest one came out last year. Both of them show the process that I've just described, not in the same words, but the process is there.

It's clear that that kind of understanding isn't new or radical, it has been around a long time. It reflects what's commonly known as negative feedback control, I have a predelection for approaching this from a control systems idea, so I offered a diagram of a very simple negative feedback control which is to control room temperature.

We have a desired room temperature set on a thermostat. What the thermostat does is compare the desired temperature with the actual and then it makes a pair of decisions; it says: If the actual temperature is larger or equal to the desired temperature, then you leave the -- if the furnace is on, turn it off; if it is not on, leave it off. But, in any event, go back and keep sensing the room temperature.

It says in a simple way and it actually -- the mechanism in there actually does this; it says: If the actual temperature is less than the desired temperature, turn the furnace -- if it is off, turn it on; and if it is already on, leave it on, but

in any event continue sensing the room temperature.

What happens over time to room temperature is that if the orange line is the desired temperature, the room temperature will cycle about it, and if you change the desired temperature it will gradually find it and cycle about it.

You can actually see on this diagram that at that point the furnace would be on (indicating), at that point it would turn off (indicating), but the heat remaining in the heating system, heating ducts and so on would continue to warm the room over a period of time and then you would dissipate that, the room would begin to cool down. At that point the furnace would come back on again. It would take it a while to circulate the heat to bring the room back up to that temperature, it would turn off and there would be overshoot.

The nature of that control depends entirely on how tight this feedback group is built. If you control temperature to the nearest tenth of a degree and if you put an air conditioning system so that you don't let the thing overheat, you can keep the temperature very even, so that in a controlled temperature chamber we think nothing of keeping the temperature plus or minus one degree.

In a room, a feedback control would let the temperature vary by 5 or 10 degrees sometimes, five comfortably.

That's true in the way we manage systems. If you want good system control, you build your feedback groups, you have high sensitivity so that they detect deviation from the goal quickly.

I should point out that the reasons these are called negative feedback control is that they are always trying to bring the system back to the goal. So when the temperature is down here (indicating) the furnace is turned on to bring the temperature up and when the temperature is above what the thermostat is set at, it turns the furnace off and let's the room cool down. So that the tendency is always to center on a goal.

Now, I would suggest that most managers - and I have added in their critics - believe they operate that way, that if you ask people how do you, you know, show them something like this, they say that's exactly the way I do it. Yet we have problems, and I would suggest that the problems are caused by things like the objectives are not defined in a reachable way.

If that orange line in the previous

diagram, if I walked over to the thermostat on the wall and said: Keep the room at a comfortable temperature and then walked away, I wouldn't have much expectation that I would have gained any influence or control over room temperature, nor would I be able to fault the system if didn't deliver.

The objective, if you are going to reach it, has to be set. The measures of objectives and actions are too coarse to allow system control. If we said we wanted to be comfortable in this room and installed a system that only had a plus or minus 10 degree response in it, we would not be comfortable.

If we want a certain volume delivered from the forest and we want to be within 10 per cent of that, then we better have a control system in place that can sense deviations from the goal of less than 10 per cent.

Even though we believe we operate this way, we go out occasionally because the feedback control is to loose either in timing or the accuracy of the measurement that we, in the case of a thermostat, we sense temperature continuously; in the case of a forest, we measure it once every five years, we do a management plan every five years, that's when the feedback loop closes, that's when the thermostat has

something to compare to, and we don't even try to detect anything finer in a five-year response.

THE CHAIRMAN: But that's the case, is it not, when the objective that you are looking at is quantifiable as opposed to qualitative in nature? It becomes more difficult when it is qualitative in order to get unanimity of agreement on when you are deviating and when you aren't and the degree of that deviation; is it not?

THE WITNESS: Well, if you haven't established a reference point, then how can you tell whether you are moving away from it or towards it.

THE CHAIRMAN: And I am saying, when it is something like volume, it is easier to quantify than it is something like aesthetics, if that were your value that you were trying to --

THE WITNESS: Yes, uh-huh. Although even there has been some interesting things done in terms of looking at three-dimensional plans and vistas and saying this looks prettier than that, so we will try to build it this way.

The point is correct though, that if you cannot establish where it is you want to be, you can be pretty sure you won't know whether you get there or not. The ancient Seneca some years before B.C. said

that our plans miscarry because we sail well but we don't know what port we are heading for, in essence was his message.

Another reason for poor performance, is there an absence of cause/effect connections between the objectives and the actions taken. The simple example I showed you of the thermostat, the cause/effect connection is simple and clear; you can turn the heat on or off.

Our actions in controlling system dynamics in a forest must similarly be related to the dynamics of the system. If you want more volume, how do you grow more volume, how do you get the yield curves higher or more stands higher on the existing yield curves. But it isn't a case of saying you will do good things, it has to be things that have a cause/effect connection to the objective that you are trying to close on.

Another way of saying that is that actions in the forest do not possess good by virtue of just being good, they possess good by virtue of allowing you to close on a goal.

We get in trouble because we make evaluation of performance versus the forecast in a non-quantitative manner - and this is what you just

referred to, Mr. Chairman - we argue endlessly about whether or not we have enough volume. So whether we are running out of trees, rather than to say: Our target was this amount and our forecast is that we can get this amount, now what do we think seeing those two forecasts.

I guess what it comes to is that it is pretty easy to say: Do it right, but it's a lot more difficult to in fact in a forest, in a complex system spread over a hundred thousand hectares, it is not a simple straightforward thing to make all of those things happen consistently over that area over a 40-year time horizon, it takes substantial control of the action sets.

If I were to turn that around and pose that the other way as problems, I would say that our principal problems in resource management are the business of measurable targets. We seem to feel very comfortable, particularly in the public domain, in speaking of targets that aren't quantified. More, better, less, every time we do that we make -- we create a situation for confusion because who is to say what's more and what's less if we in fact aren't measuring them.

We have a problem in that system control

can be no better than the resolution of the measures used in feedback control, the tools we use, the measures we use, how frequently we can assess the population of trees or a population of deer, how frequently can we measure them to see whether they are going up or down, the cause/effect thing in the system control being no better than the frequency.

So they are -- in the one sense we believe we are doing those things, the problems are simply the converse; we frequently are not in fact doing them. Well, we talk about them, we are not doing them.

Now, against that background I would suggest that forest management as it exists in say the text of Larry Davis, which is a current one, is essentially similar to adaptive management as described by Holling which I think is the first major reference to it, it's a booked called Adaptive Environmental Assessment in Management, and Walters' book on Adaptive Management of Renewable Resources.

Both, if you look at them, are built on negative feedback control but there is a difference. If you look at traditional management, it tends to assume that the forecasts used are accurate and, therefore, that the process tends to evaluate with an

eye to verifying the forecasts.

As I did recently go through Larry Davis' book and look at it, I think that's a fair statement, that it invites you to validate your forecast. The difference is that adaptive management assumes the forecasts are inaccurate, that they represent the best current approximation. In fact the phrase that Holling and Walters both use is a hypothesis, and with a hypothesis what you do is attempt to invalidate it.

And the philosophical approach between those two, between trying to shore up something you've said and trying to defeat it and replace it with a better hypothesis are significantly different, and I believe that adaptive management, just for that reason, offers some advantage in managing renewable resources.

Practice, the way Holling and Walters have written about it, it literally invites you to invalidate your hypotheses. They are very careful never to use the word validation, they speak always of invalidation.

If I looked at the data needs for adaptive management and management in the classic sense as described in current text, again they are essentially the same. For any forest that we are going to manage where we want to make a forecast of

performance so that we can examine our possibilities, whether that forecast is being made by a forester, an environmentalist or a lawyer, it will have embedded in it yield curves and age-class structure, a harvest schedule and a treatment schedule. The only thing at issue is the degree to which those four characteristics are visible, transparent, the degree to which the reviewer can examine them and see how they are made.

Supply forecast/supply availability, put it that way, the forecast of the availability of any characteristic in a forest contain those features either explicitly, as I have shown in the diagrams that we have looked at in the overheads, or implicitly.

The idea of adaptive management emerged in the period '72 to '75 when Holling and a group of others were working on a giant model of New Brunswick that covered spacially the entire province and covered the entire forest and the budworm growing in it, and we were attempting to put everything together all at once. And one of the things that emerged from that exercise was that the sensitivity or the outcome to error in the forecasts were such that we should be looking for the earliest possible moment to detect the error rather than trying to shore up the forecast, that it was safer, inherently safer, as the thermostat does; it

looks for error rather than looks for confirmation.

So to continue the summary here. If we go back to the importance of those four things, the yield curves, age structure, harvest schedule and treatment schedule, they form the basis of the forecast that underlie either a management plan or a comment on a management plan, either one.

I would argue that if you make a comment on a management plan there is a clear inference that you know something about yield curves, age-class structure, harvest schedule and treatment schedule. I don't how how you could comment on a management plan without in fact inferring something about those four.

You should realize that all of those are future oriented, they are things that haven't happened yet. The yield curve is drawn for where stands will grow, the age-class structure is where we think stands are and how they will develop over time, the harvest schedule is which stands we think we will cut, when and where, and the treatment schedule is which cut-overs will respond. So they are all future oriented things.

The important point of that is that we can't have data on the future; in the context in which we design management, we will never have complete data because we can't have data on the future. What we can

have is complete data on the current state of the forest given a complete inventory that showed all the current yield curves -- all the age-class structures and yield curves and so on, we could get the current state.

But from the point of view of how these are used in management design and in terms of the criticism of management design, it is not possible to have data on an event that has not yet occurred. And I would submit that in things like impact assessment or management, which to me are very analogous kinds of situations, what we are talking about are two forecasts.

So the suggestion is that in these circumstances it would be prudent for a manager to have good forecasts, the best he can get currently of those based on his experience, based on data, where he has got data, as much of it as he can lay hands on relative to past performance of similar systems, but he should remember when he is doing that, when you use data, inherent in its use will be the presumption that the future will repeat the past.

If I make a forecast and simply project it forward a set of data points, I am saying that the future will be just like the past only more so. If I

have any reason to believe that that won't be true, that's a pretty dangerous forecast.

In a system where we are intentionally disturbing the dynamics by a harvest schedule and a silviculture system, the future will repeat the past is a very dangerous approach, so the prudent manager will watch each little bit of the unfolding future as it is exposed to him to detect at the earliest possible time when he has made a mistake in a yield curve, in an age-class structure, in his ability to enforce a harvest schedule, in his ability to implement a treatment schedule. Any one of those will -- error in any one of those will invalidate or at least make his design inaccurate.

Now, I guess I would like to make at least one more point here that's fairly important. If we take that one step further, I would like to suggest that not all data problems are equal, so that if you look at the simple forecast that we made you might intuitively agree with me that it would be highly subject to error in the proportion of the stands that went to poor cut-over as opposed to plantation, for instance.

I sent 15 per cent of the cut-over each year to the poor cut-over and I sent something like 20

per cent of the cut-over each year to plantation, maybe it should have been the other way around. The error that's involved in those two will not be equivalent and I will show you in a minute what I mean.

That 20 per cent error in the maximum volume that a plantation might achieve could easily be lost in the slot because in the first -- remember I said no stand would be cut at rotation in the next R years, who cares how much it is actually going to have in terms of what happens to us for whatever number of years R is, the rotation. What's going to count is the availability of the things that are on the fronts of those yield curves.

There are simple ways to examine which places data can cause you serious trouble, and the simplest way to do that is to take a forecast - and this is the same one we were looking at earlier - and what I did was I ran several simulations and I would change this curve a little tiny bit here (indicating), up or down, and see whether or not -- what it did to my total volume flow, and I found that a very small change in that curve created a very large error in the total volume that was sustainable from this particular forest.

Similarly, if there is an error in those

age-classes, if that one over here so that it's already on this declining place, declining part of the yield curve, you've made a big, big difference in the sustainable volume.

On the other hand, if I change that particular part of the plantation yield curve I could move that up or down 20 or 30 per and I couldn't detect it in the sustainable harvest from this forest.

Now, intuitively you should be able to see what is happening here. The system will be -- this system, because it has a very large block of forest that is on the declining part of that yield curve, the system is going to be very sensitive to how that is available to the harvest schedule and how quickly the replacement stands will come on line. So the sensitivities are -- the latter part of that curve and the front parts of the response curves. The last stands we cut will come off -- go off that yield curve and the next ones after that will have to come off the fronts of these.

You can go through this and find that it doesn't make much difference if you are out in the volume response here or here or here. (indicating) I say it doesn't make much difference, it's hard to detect a 15 per cent error in that; but you can detect

a 5 per cent error there (indicating), a 10 per cent error is easily detectable there. (indicating) If you move any of these ones marked 2, 10 per cent either way, it will drop the sustainable volume by 15 to 20 per cent over an 80-year time horizon.

Now, the message from this is that by doing this with a simple -- our first approximation structure, you can say I'm not going to spend a lot of money trying to get data here (indicating), but I'm going to spend an awful lot of money trying to get data on the 1s, 2s and 3s because they can get me in a lot of trouble if I'm wrong there. (indicating)

MR. TURKSTRA: Q. Dr. Baskerville, just so that the record follows what you were saying, you are chart 68 and the arrows marked 1 are those with the highest impact when they vary from a forecast; is that correct?

A. Yes.

Q. They are the most sensitive?

A. Yes.

Q. And the arrows marked 5 -- I'm sorry, marked 5 are the least sensitive?

A. That's correct.

Q. So this picks up -- this is really your analysis of what are the most sensitive factors--

A. Yes.

Q. --in gathering data?

A. So the procedure here is to make these as good as you can with the data you have got and begin, and as you begin today, do another analysis to find out where should I be watching for a problem that could cause me a lot of grief; and the answer is: Watch the 1s, 2s and 3s because in this particular forest - mind you, that is unique to this age-class structure, harvest schedule and silviculture schedule - in that particular forest the place you get in trouble are the places that are marked 1, 2 and 3; and errors in the places marked 4 and 5 would be inconsequential and at least you would have many years to recover from.

Q. And Dr. Baskerville, just so that I have that absolutely clear, those conclusions as to what were the most sensitive in this particular forest are the result of model runs that you ran to see: If I varied this, what are the consequences in volumes produced?

A. That's correct.

Q. So these conclusions are drawn from model runs that you yourself ran?

A. Yeah.

Q. but they relate to a specific forest

whose characteristics that you were looking at in that model?

A. Yes. For this forest starting with that natural stand and the scheduled harvesting oldest first and the silviculture schedule that distributed by percentage actually to those four treatment types, the sustainable harvest volume - I did this on volume regulation I'm sorry - the sustainable harvest level is most sensitive to error there in 1 and 2, and least sensitive to error in 5s.

Q. Now, does it mean that in another forest if you ran the same model you might find that the sensitivity ratios were out of whack or were different than what you --

A. Different.

Q. Different.

A. Dramatically different.

Q. So these -- the sensitivity of --

A. Take that age-class out right there (indicating) and you would change the picture dramatically. What makes this sensitive is that you're losing stands; if you don't harvest them in order, they actually lose volume.

So if those weren't there, it would very quickly probably focus somewhere down in the front of

that curve.

Q. So that you are not suggesting that the Board could generally say that the order of sensitivity in this analysis is necessarily what it was in this model run?

A. No, sir, I hope I haven't left that impression.

Q. Okay.

A. I didn't; did I? This is something that I believe is reasonable for a prudent manager to do in each management plan.

THE CHAIRMAN: Can you do the same type of exercise with area regulation?

THE WITNESS: Yes, sir.

So the message there was that while it's never possible to make the future certain we do have some ways of finding which uncertainties we should be most worried about, most concerned about, which uncertainties we should focus our effort to gather information on.

There is a very strong analogue in the literature. In fact, my ideas on this were generated largely by environmental impact assessment literature which suggests a similar sort of approach. You may be familiar with the analysis for the Beaufort Islands oil

thing which hinged heavily on an approach like this, finding which of the uncertainties could cause the most grief.

What I would like to try now is to put integrated management in a context that follows with that.

MR. TURKSTRA: Q. And we are at slide 70 now?

A. 70.

Q. Thank you.

A. Is this pace reasonable?

THE CHAIRMAN: Yes.

THE WITNESS: Okay. If I were to try and write a generic description of integrated management, I would do it analogous to what we've just alked about, I would try to characterize stand value for each feature that I was going to manage for.

I know that the stand changes in its configuration over time and I know that the appearance of the stand influences what it's worth for sawlogs or what it's worth for warbler habitat or whatever, so what I would try to do is characterize the value in whatever form I measured it, and I would -- I would not try to use the same number, I would use volume for volume and I would use breeding pairs for breeding

pairs. I would then examine a harvest schedule, a treatment schedule for a forest level output and to see what it did to each species group or product.

I really think that the emphasis at the stage we are at now should go more on what I would call analysis of dynamics than on being prescriptive. I think we've had a tendency in our business to jump to prescription without having been thoroughly analytical at this level.

I fear large optimization models for that reason, I think that they do not allow the person who will be responsible for the decision to see transparently what the impact will be of a given harvest and silviculture schedule on all of the values that he's concerned about.

So I would do this in the manner that we just showed, with simple diagrams where you can see them with a model that displays those kinds of data; the age-class structures and the distributions and everything, you can see what is happening.

What you are seeking is the harvest level and the silviculture schedule which delivers at the forest level the desired balance of features; whether that is by species, group or product, what's the output? The output that you are after is some balance

of those features.

I would suggest that first what you do is find out what the possible mixtures are that you can have sustainably; how much volume can you have and still retain sufficient owl habitat to have two breeding pairs per kilometre or whatever, square kilometre.

Having examined and chosen one of these, you then try to implement the schedule, this harvest and silviculture schedule, and then assess the performance of each feature relative to the desired level, you set a level. When you made this examination, you actually came out with: This is how many of those I would like per square kilometre or per hectare or whatever, you now examine to see whether or not the availability of stand types over time could in fact deliver that for this harvest schedule and this silviculture schedule.

I have tried to make a diagram that might show that, and it's not easy to make one that isn't complicated, but if this were an age-class structure and a yield curve, supposing we had a group of species that required some early successional stages and some late successional stages - that might be ungulates - supposing we had some that required only late

successional stages, like very late successional stages like owls and whatever more you had, you find a harvest schedule and a treatment schedule which will generate a series of age-class structures under this for each treatment they will give you a volume and a response to one of these, just exactly like we did with the volume, where this one is the good regen, one for poor regen and one for plantation.

These things will also look different just as the volume did. And, in fact, if we made the things that were on the right-hand side by forest area, forest level indicators on the area or regulation things we were looking at, years in the future we might see that the harvest volume went out like that (indicating) with a little dip in it, that the population for the first group of species went like that (indicating) and the population for the second level of species actually went to extinction. You would then go back, find a new silviculture schedule and a new harvest schedule and may be wind up with the dotted lines here. (indicating)

Now, we could keep playing that, I tried a couple. Here it shows the harvest level lower, these still going, this one sustaining, but you could make the forecast, it would be quantitative, it would be

based on things that you had some reason to believe that the stand level and could aggregate to the forest level systematically.

And a different one again - whoops - would give you again a different pattern, so that you could say that you wanted lots of owls and you were willing to give up wood to get it. But you could make the tradeoffs then explicitly.

THE CHAIRMAN: Well, Dean Baskerville, the examples you have been using are encompassing a situation whereby you may look at a different specie out there that you are interested in protecting and then adjusting accordingly once you have your data in terms of the criteria that you are looking at, but what happens when you have, in a given management unit, a hundred species of various wildlife, add to that fish resources r fisheries, add to that tourist resources, et cetera, and try and get it all into a workable situation where you plot all of the data, such as you have been indicating to us, and then you find out that with to one or two species you are not managing to the level that you want to; and, therefore, you have to go back and adjust the harvest or silviculture prescriptions to try and get that specie to where you want it but, in doing so, a different specie may be out

of whack in terms of--

THE WITNESS: Oh yes.

THE CHAIRMAN: --or a different resource or value may be out of whack--

THE WITNESS: Mm-hmm.

THE CHAIRMAN: --how does, from a practical standpoint, the forest manager go about doing all of this and yet still be able to produce a management plan that is acceptable, given the fact that when it's subject to review in the normal course of things under any management system that we have looked at in this hearing, there will be other concerns brought into it at later stages which may then require you going back again and trying to adjust the harvest or silviculture aspect of it to try and accommodate whatever views are brought in at whatever stage.

I'm having a little difficulty - and I don't know if I'm speaking for my colleagues - with how you work all of this in in a quantitative form and yet still end up practically with a plan that is acceptable with all of the adjustments made so that everything is taken care of.

THE WITNESS: The manager is caught on the proverbial horns of the dilemma. If in fact that number goes on up to a hundred and he's going to start

making changes in this in order to adjust for those without having gone through this. (indicating)

THE CHAIRMAN: I don't know much about mathematics, but I can imagine that the permutations and combinations would make it into a really large number.

THE WITNESS: Oh yes, it would certainly be complicated. But there are two alternatives, one is to try and do it, try and resolve it; the other is to say: We will ignore all of this and we'll simply make tinkering changes in this on the assumption that if we change the actions these things will be fixed.

A constraint approach goes direct to this, direct to the harvest and the treatment and says: I will place constraints here and I don't have to worry with any of this, I won't ever make those measures because they are not relevant, as long as I properly constrain these two schedules everything will be okay.

Now, if you believe that, I would like -- I've got a car I would like to sell you.

THE CHAIRMAN: How about some swampland in Florida.

THE WITNESS: The real issue becomes - no, you have hit right on the nub of the thing - the real issue is: How do you reduce this to a workable

number. It probably borders on infinite. The best example that I have seen is for the Blue Mountains in Oregon, a person named Jack Ward Thomas whose name you must have been revealed by already at this stage.

Incidentally, if you want a really entertaining presentation in a deep south accent, you should get him in. He's good.

What he did was reduce the species mixture in the Blue Mountains to 14 guilds and he said the ungulates all require essentially the same sort of thing, the warblers require the same sort of thing, owls, but he characterized the species group just the way we characterize the forest.

We characterize this: This is a stand type but if we wanted to we could have, I suppose that in the forests that I looked at, even in a relatively simple forest like the Plonski, I bet you that you could have 50 yield curves - okay, 40 - that we could have 40 different stand classifications by the time you took site and species mix into account. There's only four or five principal species and four or five sites, but already we are up to 16.

We get started looking at operability. It wouldn't take very long to get a very large number of those, and we have found ways to come to grips with

reality and say: We will compact them into six yield curves because that is how many we think are reasonable to reflect reality.

We have got to find a way quickly, and I say we have to because I really believe we have to. If we want to know whether we are influencing species that have that kind of a habitat requirement, we better find a way to make explicit forecasts of its availability so that we can tell whether or not these things are in fact delivering it in the amounts that we might need.

So the issue is going to be: How do you build these things. It won't be the hundred, mostly -- not because it wasn't computationally possible, with existing computers you could put in a hundred, but it wouldn't be transparent.

THE CHAIRMAN: But will it be an unreasonable amount when you take into account not just wildlife vis-a-vis timber management, but all other uses of the forest vis-a-vis timber management in addition to wildlife?

THE WITNESS: Will it be an unreasonable amount? It won't be unreasonable if that is what society wants, because they own the forest and we are going to manage it for them. What will be unreasonable or unreasonable will be the way in which we

characterize it, so that we have any belief and have any reasonable professional belief in a cause/effect way that these harvest and silviculture schedules will deliver what we want.

THE CHAIRMAN: Well, maybe the question is not whether it will be reasonable or unreasonable, because that can be defined as to what your objectives are.

THE WITNESS: Yes.

THE CHAIRMAN: But will it be practically possible to manage the forest on a five-year timber management plan basis given the amount of public input that you would want into the development of those plans, given the fact that every time there is input you may have to go back in effect to rerun the model, and given the fact that you need the public input supposedly because you haven't got a database that would allow you to run the model completely from the beginning, you're relying on some of that data presumably from input from other users.

THE WITNESS: Mm-hmm.

THE CHAIRMAN: Which you don't have documented to the point that you can call it a database.

THE WITNESS: Could we do that today;

clearly not, but I would suggest - this is 1989 - in 1979 I believe it would be fair to say that not a single province in Canada had a systematic way of forecasting wood availability in the sense that we have looked at it here today, and that in 1989 not a single province does not use such a computer tool, and that in the interim the yield curves didn't suddenly materialize and we didn't suddenly become very wise about the future; we learned to make reasonable approximations of these and to begin testing them.

It seems to me that what we need in these other areas is very quickly to begin approaching them in a similar way. And so in answer to your question, no, we can't do it today; could we do it in 10 years from now? I would be really surprised if we could not.

MR. MARTEL: Is there anybody ahead of us?

THE WITNESS: No, I don't think so.

THE CHAIRMAN: Ahead meaning Ontario or Canada or New Brunswick or what.

THE WITNESS: From what I'm aware this is not -- we are not looking at a trivial problem here by any stretch of the imagination. There are two problems, the computational one which may be not trivial but it's not big, but there is a philosophical

one and it's to get from the mode of: How do I put constraints on the harvest schedule and the treatment schedule that will make me feel comfortable and satisfice the public; how do we get away from that and say: I want to create not that line (indicating) but that one (indicating), how do I -- that is a real philosophical leap, to move from simply focussing on: How to do I stop something here, to how do I start something here. (indicating) And it won't come easy.

Is anybody ahead? If they are it's not by very much. New Brunswick has begun to do this, they have started with two guilds, characterized as ungulates and marten because they happen to be related to quite a large number of things and they are easy to start with, the Blue Mountain thing in Oregon, but for a whole jurisdiction the size of this, no, I'm not aware of it.

MR. MARTEL: Well, is the featured species approach the direct --

THE WITNESS: Analagous. That is analagous to what -- guild or featured species, yes.

MR. MARTEL: Yes. But in your opinion we are moving in the right direction?

THE WITNESS: If you are moving in that direction you are; yes, sir.

THE CHAIRMAN: Have any jurisdictions, to your knowledge, Dean Baskerville, moved substantially ahead in areas which are non-wildlife and non-timber, the other values which cannot be categorized in those categories?

THE WITNESS: My knowledge that I could comment on would be, say, Newfoundland -- well, the Atlantic Provinces, Ontario, a little bit in Alberta and some fair experience in B.C.

And my reaction would be that right across the country we are having trouble in making the philosophical switch from constraining these to trying to build these, but that mind set is out there, that what we have got to do is stop these guys rather than change these things so that we generate what we want here.

And I don't see that happening real fast. It's emerging everywhere. I can go and have a real nice conversation about this four or five places in this province, a couple of places in New Brunswick, Alberta and B.C., but if you ask: Is a whole jurisdiction moved from constraining these to designing these, I would say no.

THE CHAIRMAN: And where does that start or what is the impetus behind it; is it from central

management down into the field, or is it the other way around; like, where would that likely gain credence or acceptance from?

THE WITNESS: There are some people in the audience who will know that in my course one of the books that students read is Sol Olinsky's Rules for Radicals which suggests that the best way to change a system is to infiltrate and subvert. And I don't mean that facetiously, I truly believe that if you want to start this, that this is the kind of thing that you put in at the level where the guy who thinks that way and the guy who thinks this way are standing on the forest, they are actually on the forest, which means I would start at the bottom. Indeed it's happening, sir.

MR. TURKSTRA: Q. Is it happening in Ontario?

A. Yes, sir.

Q. Can you give some examples to the Board of how it may be starting at the bottom?

A. I have seen some things, discussions of building habitat analyses in northwestern Ontario and I have heard of work that is being done in Timmins, so I'm sure that -- the kinds of discussions tell me that they are looking at matching this with this and this and this (indicating), that the thought process is

there.

You see, if you can do this, even in a simplistic form and put things like successful hunter days as a measure on deer, if you can do that there's some real interesting things -- you could do a sensitivity analysis on those as well as you could on the yield curves and find out what was the risk of completely blowing your objectives set by the population who own them, or the people population who own the resource.

You smile. I don't argue that we could do this today or tomorrow, I argue strenously that we should move in that direction as vigorously as we can. I do believe we could be there in 10 years.

Not a single person, I couldn't sell a wood supply model in this province in 1979 and I tried hard, and you couldn't get anybody to talk wood supply - I meant in this country, not in the province - you couldn't get anybody in this country to talk to you about wood supply without using a systematic forecaster now.

MR. MARTEL: I smile simply because it's been hard to convince the public they own the forest.

THE WITNESS: Oh, they do. It only took three years working for a minister to discover that,

sir.

MR. TURKSTRA: Q. Does this have any relationship to the manual that you spoke about?

A. Say again, please?

Q. Does this have any relationship to the manual you spoke about?

A. Not really, in that the manual dealt correctly, I guess because it was a timber management manual, only with this.

Q. All right.

A. And where it went out to here, but not with the other features.

Q. Dr. Baskerville, you are going to have to help me on this. I have note here under this book that says the moose hotel. Is this the point to ask you about that?

A. It came -- whoops, I will leave that on. The issue here -- I guess if I leave no other impression it's that if we want to gain control over, into future, the availability of different kinds of populations of wildlife and of harvests and so on, that the way to do it is to move as quickly as we can to explicit forecasting of their habitat requirements that is related to a harvest and a timber schedule; and to move as quickly as we can away from simply putting

constraints on these two sets of activities.

And the moose motel was an example that came up at an international wildlife conference that showed aerial pictures of moose corridors left in cut-overs in northern Ontario and the question was asked of the person who presented it, whether or not the moose used them, and the answer was he didn't know, and we can't afford that -- you see, the person sitting beside me happened to be from the company who had gone to the expense of leaving moose motels and he visibly rose in his seat.

The instant you impose a constraint on here, the cost in terms of the harvest is experienced. It appears as 3-cents a cubic metre just like that the next day, you see it instantly. And so someone asks: Where's the benefit for that, and the answer is: We've got some moose motels but we don't know if the moose use them.

I don't think that that is a professionally reasonable way to approach this problem, nor is it acceptable given the public interest in this. We should be able to tell them that we have controlled the habitat to present to these populations certain habitat opportunities which we believe would allow that level of population maintenance over time, and not

simply be telling them that we did some nice things.

Q. Dr. Baskerville, one last page before we get to the audit.

MR. TURKSTRA: And, Mr. Chairman, if I can ask Dr. Baskerville to just cover that concluding page, then I was going to suggest that it might be appropriate to break.

THE WITNESS: Yes. So I guess I would argue that integrated management, like any management, if we are going to integrate it, means to me that you have either brought together or matched or balanced and to do that you must know levels. To do that requires some measure of performance. The habitat diagrams that I showed in the -- like habitat yield curves in the previous slide were measures of performance. Those allow you to define the problem. These things allow you to define the problem, the problem being this yield going to extinction.

In order to define that problem in terms of its timing and its degree, when it occurs and how badly it occurs, you need to have a measure of performance, you need to have a measure in order to design a solution: This change in the harvest schedule and the silviculture schedule will create this habitat of the kind that is needed in order to change that red

line for the owl population or whatever it was; and, thirdly, you need measures to evaluate the efficacy of the solution: Did it or did it not out in the woods, can you actually detect in the woods if it's any better than it was.

THE CHAIRMAN: Dean Baskerville, does that prevent, in your view, managing different resources through different programs and then trying to tie them together in terms of forecasting impact from one program towards another?

THE WITNESS: Does it preclude, does it make it impossible? Almost. Technically it should be possible to draw these curves in one department, these in another, these in another and run this in another and as long as they did it in a manner that their models were consistent they could overlay and make a run.

The nature of human minds is such that if those people get very far apart, particularly if this isn't done at the woods level, I think that you could -- it would be very difficult.

THE CHAIRMAN: Well, if they are done on different land bases, different area bases.

THE WITNESS: If the land base on which you set the goals and the land base on which you have

these two controls are different, you cannot do it. I mean, that is the control right there, those two schedules are what control the availability of habitat into the future.

So you can't control -- if you want to control habitat, there is the game right there, that is the whole thing.

THE CHAIRMAN: And if that in fact is the way it is managed to date using different management unit areas.

THE WITNESS: Non-conformable ones, yes.

THE CHAIRMAN: Right.

THE WITNESS: Mm-hmm.

THE CHAIRMAN: And managing different resources through different programs, albeit objectives are defined, et cetera, and then trying to essentially forecast the impacts of one management program on the other, and that is the way it's set up--

THE WITNESS: Mm-hmm.

THE CHAIRMAN: --what do you do at this point in time, short of dismantling everything and starting from scratch?

THE WITNESS: Two choices; one would be to disaggregate your more global objectives down so that they were explicit at the level at which you have

control of those two things, because those two schedules really are going to determine the pattern in the forest in the future. That is it right there.

So get them -- disaggregate somehow or other the more global objectives down so that they are explicit at that level. I guess that really is the only choice, because to try and go bigger than the present management units, to me they are large now, you get up to 200,000 hectares which is not an unusual size in those.

THE CHAIRMAN: You are talking the wildlife management unit.

THE WITNESS: No, for a management unit.

THE CHAIRMAN: Okay.

THE WITNESS: The precision with which you can act at that scale is reduced.

MR. TURKSTRA: Dr. Baskerville --

MR. MARTEL: You'd have to have the same--

THE WITNESS: Pardon?

MR. MARTEL: The forest management units and wildlife management units should be the same?

THE WITNESS: Either that, or if you -- the present way the wildlife things are embody, wildlife region I guess, embodies many management

units.

MR. MARTEL: Mm-hmm.

THE WITNESS: If you want to have any way of being able to see whether or not you are adjusting these things to close on a goal, you will have to take the larger objective and disaggregate it to the elements - I don't have an overhead of it - but if you have got that many of those management units, looking at Figure 1 --

THE CHAIRMAN: What page are you referring to, sorry?

THE WITNESS: On page 6, it's just a map of the province. If you took a group of management units, say 20 of them that are in northwestern Ontario all within one wildlife management unit, you would have to disaggregate that global goal for the whole management unit down to individual units, if you wanted to get it to a level where you could ever tell if these two tools were causing you to close on the goal or depart from it.

MR. TURKSTRA: Q. Dr. Baskerville, just on that point, do you have an opinion then as to whether or not a unit larger than a forest management unit can appropriately be used to put the kind of process that you have described effectively into place?

A. The upper limit on the size of the unit would have to do with how much manpower you put in it.

At coffee break I had a discussion with one of my colleagues. I was fortunate enough to have a visit to Sweden last summer and Canada suffers unduly from Swede envy when it comes to forestry, but they arranged for me to spend several days in different companies, in different organizations beginning each day at the very top.

So that I started with the vice-president of Storah, I had about a half an hour with him and then went to the people who were the main managing directors at the forestry level, spent two or three hours with them, looked at some considerable detail at their models that they were using for forecasting, then spent about three hours over lunch with the guys that actually ran those models and used them, then after lunch went to the woods to a regional level and talked to the guys who are taking the output from the models and implementing it.

About three o'clock in the afternoon I found myself standing in the woods with the guy who was making all of this happen. And the thing that just absolutely floored me was the total utter consistency

from top to bottom in that structure. It was unbelievable, I couldn't believe it.

The words and the use of the words and what it meant, and when you got to the bottom what was happening. And then it dawned on me that the last guy I talked to is responsible for 10,000 hectares, and he had about half a dozen technicians and maybe one or two foresters. Your average unit forester in this province is responsible for the order of 150- to 200,000 hectares and he's virtually naked with respect to technical assistance.

Our ability to make these things come to ground, we shouldn't even be talking comparison with the European structure because we don't have the manpower to even come close.

THE CHAIRMAN: But of course they don't have the total area either.

THE WITNESS: No, they sure don't.

THE CHAIRMAN: So relatively speaking, you might have a similar expenditure in terms of forestry there that you might even have here, or something more comparable.

THE WITNESS: Yes. I think if you looked at it in total that is an interesting -- I have never thought of that, but that's true.

I am sorry, Mr. Turkstra, in the process of telling my anecdote, I forgot your question.

MR. TURKSTRA: Q. Well, my question was: You described a process of evaluation of management plans and I wasn't sure if you had stated whether or not the appropriate size of the unit for that evaluation to be taken?

A. Yes. If you make the unit too big your ability to plan and control the structure down to the bottom that implements gets weak.

So our limitation, in this country, is primarily on our structure from the level of the guy that actually designs the plan down to what happens in the woods, and we are really weak there.

MR. MARTEL: Over in Europe if one making that dollar comparison, they don't have the magnitude of the forest and, therefore, the value shouldn't be as great as the forests that are here and you should be able to put more people in the field here.

THE WITNESS: I suppose, but it works the other way around; they deliver wood at $90 a cubic metre and here if it got over $40 a cubic metre I suppose the industry would roll on the floor and their eyes would go up.

THE CHAIRMAN: A few in the back of the

room are rolling on the floor with their eyes going up.

THE WITNESS: The difference is the array of values that they take and their ability to manage moose populations is startling in that structure. I mean, it's impressive, but it also has to do with the size of the unit that -- they disaggregate the management down to something of the order of 10,000 hectares. We are disaggregating management in this province down to the order of a couple of hundred thousand hectares. Our expectations should be tempered accordingly.

MR. TURKSTRA: The next stage is to go now directly, with that background, to go directly to the audit.

THE CHAIRMAN: All right. Well, why don't we start that off tomorrow.

MR. TURKSTRA: Nine o'clock?

THE CHAIRMAN: Nine o'clock.

THE WITNESS: That is a marvelous suggestion, sir.

THE CHAIRMAN: Thank you, Dean Baskerville. We will adjourn until 9:00 a.m. tomorrow.

Thank you.

---Whereupon the hearing adjourned at 5:10 p.m., to be reconvened on Tuesday, December 5th, 1989, commencing at 9:00 a.m.